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Health situation in the South-East Asia Region: challenges for the next decade

Samlee Plianbangchang & Jai P Narain

The South-East Asia (SEA) Region of the World Health Organization (WHO), home to 26% of the world population and to 40% of the world's poor, is in the middle of a rapid economic, demographic and epidemiological transition. It suffers disproportionately from the high burden of communicable and emerging noncommunicable diseases in the background of relatively poor health infrastructure. Clearly, progress in global health is not possible without a significant improvement in the WHO South-East Asia Region.

Out of the 14.5 million deaths that occur in the South-East Asia Region every year, 3.9 million are due to communicable diseases (CDs). These diseases together with maternal, perinatal and nutritional conditions are responsible for 36% of the disability-adjusted life years lost, indicating that communicable diseases are still a major public health problem in the Region, and a threat to national and international health security. Outbreaks due to emerging and re-emerging diseases are a frequent occurrence requiring early detection and rapid response. Dengue is of particular concern as it is not only occurring in explosive outbreaks but expanding geographically to newer areas. Over the past five years, Bhutan and Nepal have reported dengue cases for the first time.

Noncommunicable diseases (NCDs) can impinge on national health and development as they not only cause premature deaths but exacerbate poverty and affect national economies. In the SEA Region, 8.3 million NCD deaths (nearly 56% of all deaths) are mainly due to cardiovascular diseases, diabetes, cancer and chronic obstructive lung diseases contributed by the four shared risk factors, namely tobacco; harmful use of alcohol; unhealthy diet; and physical inactivity. Mental illnesses and injuries also pose a considerable burden in the Region.

An interplay of socioeconomic, environmental and behavioural factors, which constitute the social determinants of health, are driving the epidemics of communicable and noncommunicable diseases. The situation is further worsened by globalization and rapid economic activity, often unplanned and

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unregulated, and by the Region’s considerable poverty, prevailing inequities, and inability to allocate increased resources for public health.2

The SEA Region has, however, made enormous strides over the past decade. Guinea worm disease has been eradicated, while poliomyelitis is now on the verge of eradication, with no cases reported from India since 2011 – a historical low for the country. The Region is also making progress in reducing child mortality, albeit slowly. In the NCD area, Member States of the Region have expressed political commitment to combat the epidemic. The Millennium Development Goal (MDG) targets for HIV, tuberculosis and malaria control also appear to be within grasp.

Against this background and in the light of notable successes, the Region will have to prepare itself to confront many public health challenges in the near future. These include prevention of NCDs, which has been the focus of several high-level meetings during 2011 including the World Economic Forum in Davos, Switzerland, Ministerial Meeting in Moscow, Russian Federation, and the United Nations High Level Meeting held in New York, United States of America. Most countries have organized consensus meetings at national level, and are now moving towards formulating and/or implementing national multisectoral plans of action on NCDs.

“Antimicrobial resistance (AMR): no action today, no cure tomorrow” was the theme of World Health Day 2011. The overuse and inappropriate use of antibiotics is a major contributor to the development of germs that are no longer susceptible to available drugs. The ministers of health of the Region issued a Jaipur Declaration on AMR in September 2011 calling for urgent action at country level to prevent AMR, otherwise no antimicrobial will remain effective in the future.

Climate change is another issue that will continue to threaten not only health security but also economic security, energy security and food security. Floods in Thailand (August 2011) are a stark reminder of things to come. Public health actions, aimed at both adaptation and mitigation, are urgently required at the government, industry and individual level. The Seventeenth Conference of Parties held in Durban, South Africa, concluded on 11 December 2011 with a landmark deal relating to emission targets, extension of Kyoto Protocol by another five years, and on establishing a Green Climate Fund, thus marking a new beginning towards real and effective action on climate change.

The health of women and children is also likely to continue to be a significant issue following the endorsement of the UN Secretary-General’s “Global Strategy on Women and Children’s Health” at the MDG Summit held in 2010. Tragically, more than 0.56 million children still die annually in the SEA Region from pneumonia and acute diarrhoea, despite the availability of simple and cost-effective interventions. A comprehensive, community-based approach to scale up prevention and case management can yield impressive results.

Overall, the progress towards achievement of MDGs is satisfactory in the Region. However, progress in achieving the maternal mortality target (MDG5) and sanitation target (MDG7) remains the lowest. It seems unlikely that the Region will achieve these targets unless an enhanced level of attention, concern and resources are directed urgently to these areas.

To address these challenges, strengthening of health systems based on the primary health care approach is of fundamental importance, especially concerns relating to quality of care, financing and human resources for health need to be addressed. In addition, health leadership
and governance must form the core of the overall response to health challenges in the coming years. There is a growing need for greater allocation of resources for health to ensure universal health coverage. However, the continuing economic crisis affecting many Member States and the announcement about the cancellation of funding from the Global Fund to fight HIV, TB and Malaria until 2014, are undermining the public health response at various levels of health care.

Clearly, the prevailing health scenario in the Region poses enormous challenges but also offers some opportunities for action. While all countries are striving to develop innovative approaches to disease control, core capacities must be strengthened for detecting new pathogens early and responding to them as rapidly as required under the International Health Regulations. The growing epidemic of NCDs, and unacceptably high maternal mortality rates require a coordinated response. Integrated approaches for control of CDs and NCDs are worth trying since many NCDs are preceded by CDs.

Building capacities in critical areas such as information technology and epidemiological workforce can contribute greatly in generating data or an evidence base for decision-making and for advocacy. The Region has a vibrant civil society and private health sector, advanced pharmaceutical and biotechnological research and development, and manufacturing capacity. They must therefore be engaged in a creative and positive manner as partners for health action.

The WHO South-East Asia Journal of Public Health launched by the WHO Regional Office for South-East Asia envisages to be a forum for exchange of research findings and sharing of experiences among countries and public health professionals in the Region. We hope that publication and dissemination of data locally and within the Region will influence health policy and strategy and contribute in some measure to improved health in the WHO SEA Region.

References


From Alma-Ata to Rio: health for all to all for equity

Ravi Narayan* & Thelma Narayan*

The WHO South-East Asia Region was one of the crucibles for development of the primary health care (PHC) concept. The Bandung Conference on Rural Hygiene held in 1937 drew global attention, through the League of Nations Health Organization, to the health needs of the poor rural populations. The first primary health units were started in Ceylon (now Sri Lanka) and Mysore state of Southern India in 1929. The Government of India established Health Survey and Development Committee (Bhore Committee) in 1946, identified access to safe water, sanitation, housing and adequate nutrition as essential conditions for healthy living with a curative-preventive mix of services available irrespective of the ability to pay, and emphasized intersectoral actions. Subsequently, primary health centres developed in several countries to reach the rural and marginalized populations. In Bangladesh, India, Indonesia, Nepal, Pakistan, Sri Lanka and Thailand several community-based primary health care experiments by civil society organizations complemented the primary health care system development by the State. These advances made significant contribution to the development of primary health care (PHC) as an approach to health system strengthening.

In 1976, a symposium organized by the Indian Council of Medical Research, New Delhi concluded that primary health centres should include primary medical care, an efficient referral system, maternal and child health (MCH) services, environmental sanitation, safe water supply, health intelligence, control of communicable diseases, school health, family planning, health education, recording of births and deaths, and family folders. A symposium held in 1980 focused on the evaluation of alternative health-care experiments. It endorsed the development of a network of frontline health workers to link communities with PHC teams and highlighted innovations like health cooperatives, nutrition-linked programmes and the use of local and traditional health resources and human power.

The 1978 Alma-Ata declaration ushered in a new paradigm of health focused on PHC and health for all. It emphasized equity, appropriate technology, inter-sectoral development and community participation, and health as a right. However, the significance of these radical concepts was soon lost, as focus continued on communicable diseases and MCH problems, with a more orthodox approach of tracking mortality and morbidity trends resulting in single disease-oriented approaches. Subsequently noncommunicable diseases and occupational/environmental health problems emerged as new priorities. Broader determinants like lifestyle behaviours, individual and collective risks and other

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upstream factors were identified, leading to broadbased health promotion strategies in many regions including Asia.

Synergy as well as dissonance developed between the PHC-oriented policies and national disease control programmes in the 1980s. Some deviations also took place in the 1990s. Globally, the new economic policies led to declining health and social sector budgets, which affected the development of the PHC infrastructure. Increasing numbers of global public-private partnerships, with a selective biomedical disease control focus, contributed to the shift from comprehensive PHC to top-down techno-managerial approaches. Social justice and equity, links between health and development, intersectoral coordination, community participation in health decision-making and health as a universal human right, which were at the core of the Alma-Ata declaration, received less attention. Market approaches to health care prevailed with growing privatization and commercialization.

At the same time, a broader social analysis of the health situation and health system also evolved. The earliest descriptions came from India in the 1980s and from London, United Kingdom, in the early 1990s. The former reiterated that “health service development is a socio-cultural process, a political process, a technology and managerial process with an epidemiological and sociological perspective”. The latter emphasized that “the primary determinants of disease are mainly economic and social and medicine and politics cannot and should not be kept apart”.

From the late 1990s, as health disparities widened, an increasing convergence between socio-epidemiologists, public health practitioners, and social activists took place with a strong community voice. They were alarmed at the increasing inequity between and within countries. Innovative projects to monitor global and regional inequities evolved such as the Global Equity Gauge Alliance. A growing global campaign for health for all as a fundamental human right also began to emerge. In 2000, the first People’s Health Assembly in Savar, Bangladesh explored why the Health for All goal had not been reached. A People’s Charter for Health adopted in the Assembly stressed the principles of universal comprehensive PHC envisioned in the 1978 Alma-Ata declaration. It stressed that “now more than ever” an equitable, participatory and intersectoral approach to health and health care was needed. The Global Forum for Health Research in Geneva, Switzerland took this charter seriously and interacted closely with civil society researchers at its annual forum to discuss the issues of poverty and health and the emerging concept of social vaccines. Between 2002 and 2004 people’s movements around this charter actively advocated for putting social determinants of health on the global agenda. This led to significant initiatives that are now changing the paradigm of health policy and action.

The World Health Report (2008) endorsed equity, solidarity and social justice to drive the PHC movement. It made evidence-based arguments for PHC reforms to improve health equity, to make health systems more people centred, health authorities more reliable, and to promote and protect the health of communities. As part of the “the way forward” it emphasized the need for mobilizing the production of knowledge, commitment of the workforce, and participation of the people. The WHO Commission on Social Determinants of Health (2008) urged governments, policymakers and health activists to participate actively in the global effort to redress inequities in health between and within countries as an issue of social justice. It explored the deeper social determinants of health equity, gender, political empowerment,
social protection, healthy environment and employment, etc. The Second Global Health Watch Report offered an alternative analysis arguing for policy changes, more research, social accountability, market regulation and appropriate interventions to support PHC with an equity focus when markets fail.

Recently in October 2011, government representatives, supported by the largest-ever presence of global civil society, expressed their determination to achieve social and health equity through action on social determinants of health and well-being within a comprehensive intersectoral approach. The most significant part of the Rio Declaration was the reiteration that “health equity is a shared responsibility and requires the engagement of all sectors of government, of all segments of society, and of all members of the international community, in an ‘all for equity and health of all’ global action”. While this may sound rhetorical, there were new elements of realism in the declaration including the commitment to “empowering the role of communities” and “strengthening civil society contribution to policy-making and to take action in advocacy, social mobilization and implementation on social determinants of health”. The Third Global Health Watch Report released at the Rio conference complemented this global realism by highlighting a set of achievable goals through a global “Right to Health” movement that would foster recognition of the right to health and health care at country level, formation of health rights monitoring bodies and accountability agents, and regional and global solidarity on health rights campaigns.

Today, the PHC challenges at community level in countries of the Region include agrarian distress like farmers’ suicides, childhood malnutrition, economic downturns affecting PHC systems, climate change, social conflicts and disasters affecting the broader context in which health systems have to be developed and sustained. These require study of factors such as poverty, inequity, exploitation, violence and marginalization. Recently this understanding was put into action to strengthen public health and epidemiology.

To conclude, the WHO South-East Asia Region has seen an emerging responsiveness, by governments and peoples’ health movements, for public policies that have begun to influence the public health systems in the Region. The Thai National Health Act and the Indian National Rural Health Mission are significant examples of civil society engagement and responsive government policies and partnerships. These exemplify new developments that are equity-oriented and social determinants-focused. What is now needed is a continued evolution of this new paradigm. Research on public health policy, health systems strengthening, and community action for health equity are required in the Region. A new socio-epidemiology paradigm must begin to reinvestigate health challenges in the Region, building on the emerging convergence between civil society advocacy, academic analysis and responsive public policy. The systems for health training, research and policy formulation should be geared up to meet the “Health for All and All for Equity Challenge”.

References


Impact of climate change on health and strategies for mitigation and adaptation

Alok K Deb, Suman Kanungo, Manjari Deb & Gopinath B Nair

Climate change and its negative impacts on health are now globally recognized. A wide variety of diseases and health conditions – ranging from heat and radiation-related illnesses to water and vector-borne diseases, under-nutrition, respiratory and cardiac problems, drowning, injuries and mental stress arising from extreme and sudden weather events and their resultant population displacements – all have been associated with various components of changing climate. However, the exact nature and extent of such impacts are yet to be firmly established since many other non-climate factors also produce or affect similar outcomes. This calls for more research specially from the underdeveloped countries, where such impacts are disproportionately more but reliable data are remarkably less. Recognizing the importance of human influences on global warming, almost all countries in the world have undertaken some kind of policies and measures to mitigate adverse climatic changes. Unfortunately, even without further addition of greenhouse gases (GHGs) in our climate, the amount of GHGs already released has the potential to continue the damages for many more decades to come. Thus, all countries should also place priorities in assessing their own vulnerabilities from climate change and take adaptive measures accordingly. As climate change exerts its impact simultaneously in many non-health sectors as well, this would require strong intersectoral cooperation at various levels.

Key words: Climate, health impact, adaptation, mitigation, strategies.

Introduction

Climate change is one of the major challenges of our time. It adds considerable stress to our societies and to the environment. From shifting weather patterns that threaten food production, to rising sea levels that increase the risk of catastrophic flooding and coastal storm surges, the impacts of climate change are global in scope and unprecedented in scale.

As the United Nations Secretary General has said, it is the major, overriding environmental issue of our time, and the single greatest challenge facing environmental regulators. It is a growing crisis with economic, health and safety, food production, security and other dimensions. Without drastic action today, adapting to these impacts in the future will be more difficult and costly.
Causes of climate change

Factors that can shape climate are called climate forcings that include variations in processes such as solar radiation, earth’s orbit and positioning, oceanic currents, volcanic eruptions, mountain-building and continental drift, and greenhouse gas concentrations. The scientific consensus on climate change is that the changes in our climate are largely caused by human activities (anthropogenic) rather than solar and other influences, and that they are largely irreversible.

The most important of these anthropogenic factors is the increase in “greenhouse gases” (GHGs) that primarily include water vapour, carbon dioxide, methane, nitrous oxide, and ozone (Table 1). They are naturally present at low concentrations in the lower atmosphere to keep the earth’s mean surface temperature at around 15°C. Without this trapping of heat the mean air temperature would be −18°C and the earth would freeze. However, the atmospheric concentrations of GHGs have been increasing alarmingly since the early industrial revolution, owing principally to rapidly increasing combustion of fossil fuels along with increase in deforestation, irrigated agriculture, animal husbandry and manufacturing processes involved in production of lime, cement, steel, fertilizers, chemicals and several other products. This has led the global mean surface temperature to increase by 0.4°C in the past 25 years, and it is projected to rise by about 1-3.5°C by 2100, along with increased temperature variability across the globe.

Signals of climate change

The evidence for climatic change is taken from a variety of sources. Reasonably complete global records of surface temperature are available since the mid-late 19th century. For earlier periods, most of the evidence is indirect—climatic changes are inferred from changes in proxies, such as vegetation, ice cores, dendrochronology, sea level change, and glacial geology.

Besides ambient temperature, global warming is also projected to increase rainfall at high latitudes and high elevations. The migration of plants to higher altitudes has been documented on numerous peaks in the European Alps, Alaska, the Sierra Nevada and New Zealand. These botanical trends, indicative of warming, have accompanied other physical changes such as the retreat of mountain glaciers across the globe.

Health impacts of climate change

A change in world climate would have wide-ranging, mostly adverse, consequences for human health. Most anticipated health impacts would entail increased rates of

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**Box 1: Impacts of climate change if current scenario continues**

- Nearly 1 million deaths in every year from 2030
- About 5 million deaths over next 10 years
- 350,000 deaths occurring each year now
- 80% of such deaths occur among children in South Asia and sub-Saharan Africa
- Over 90% deaths occur in developing countries
Impact of climate change on health

Alok K Deb et al.

Table 1: The main greenhouse gases and their potential contributions in global warming

<table>
<thead>
<tr>
<th>Greenhouse gases</th>
<th>Pre-industrial concentration (ppbv)</th>
<th>Concentration in 1994 (ppbv)</th>
<th>Atmospheric lifetime (years)</th>
<th>Anthropogenic sources</th>
<th>Global warming potential (GWP)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbon dioxide</td>
<td>278000</td>
<td>358000</td>
<td>Variable</td>
<td>Fossil fuel combustion, Land use conversion, Cement production</td>
<td>1</td>
</tr>
<tr>
<td>Methane</td>
<td>700</td>
<td>1721</td>
<td>12.2±3</td>
<td>Fossil fuels, Rice paddies, Waste dumps, Livestock</td>
<td>21§</td>
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<tr>
<td>Nitrous Oxide</td>
<td>275</td>
<td>311</td>
<td>120</td>
<td>Fertilizer, Industrial combustion</td>
<td>310</td>
</tr>
<tr>
<td>CFC-12</td>
<td>0</td>
<td>0.503</td>
<td>102</td>
<td>Liquid coolants, Foam</td>
<td>6200 – 7100*m</td>
</tr>
<tr>
<td>HCFC-22</td>
<td>0</td>
<td>0.105</td>
<td>12.1</td>
<td>Liquid coolants</td>
<td>1300 – 1400*m</td>
</tr>
<tr>
<td>Perfluoro methane</td>
<td>0</td>
<td>0.070</td>
<td>50000</td>
<td>Production of aluminium</td>
<td>6500</td>
</tr>
<tr>
<td>Sulphur hexa-fluoride</td>
<td>0</td>
<td>0.032</td>
<td>3200</td>
<td>Dielectric fluid</td>
<td>23900</td>
</tr>
</tbody>
</table>

ppbv = parts per billion volume
* GWP for a 100-year time horizon
§ Includes indirect effects of tropospheric ozone and stratospheric water vapour production
¶ No single lifetime can be defined due to different rates of uptake by different sink processes
¶¶ Net global warming potential (i.e. including the indirect effect due to ozone depletion)

illnesses and death from familiar causes. About 2500 years ago, Hippocrates noted his observations about the influence of climate on public health, especially on the incidence and severity of various infectious diseases. However, the future health outcomes may result from yet unknown climatic conditions, which in conjunction with other environmental changes, may also increase the likelihood of unfamiliar health outcomes, including the emergence of “new” infectious disease agents.

In general, changes in climatic conditions can lead to three kinds of health impacts (Figure 1): (i) direct impacts, usually caused by weather extremes; (ii) those due to various processes of environmental changes and ecological disruptions; and (iii) health consequences of population displacements and disruptions as a result of climate-induced economic dislocation, environmental decline, and conflict situations.

The consequences of indirect effects pose a greater challenge because they typically result from changes in complex processes. They include changes in the transmission of vector-borne diseases, types and quantity of air pollutants, water quality and quantity, and productivity of agro-ecosystems, with the potential for displacement of vulnerable populations as a result of declines in food supply, disruptions in food chain due to
Figure 1: Direct and indirect health impacts of climate change and measures to prevent or reduce such impacts

Natural influences on climate

Human (anthropogenic) influences on climate

Mitigation measures

Adapted from: McMichael AJ et al. Lancet. 2006; 367: 859-69
oceanic acidification following increased atmospheric carbon dioxide or sea-level rise. The El Niño phenomenon, which has raised awareness of the potential effects of climate variability on health and disease transmission, has been linked to outbreaks of malaria, cholera, dengue fever, and other emerging infectious diseases. The major types of health impacts potentially due to climate changes are summarized below.

**Extreme weather-related health effects**

The term “weather extremes” signifies individual weather events that are unusual in their occurrence or have destructive potential, such as hurricanes and tornadoes. The term “climate extremes” is used to represent the same type of event, but viewed over seasons (e.g. droughts), or longer periods. The global climate models predict that with increasing global warming the extreme weather events such as drought, floods and storms may become more frequent and intense in the future. Indeed, with warming of ocean surfaces and increases in atmospheric water vapour due to increasing temperature, the resulting intensification of the hydrological cycle corresponds to evidence in the United States and other nations of an increase in heavy rain events and prolonged droughts in the 20th century. There is evidence that El Niño events have increased in magnitude since the mid-1970s and climate change may alter the frequency and magnitude of the El Niño Southern Oscillation (ENSO) cycle.

The number of people killed by climatic, hydrological and meteorological disasters in 2008 was the highest of the last decade, with 147,722 deaths reported worldwide. Such extreme events also take a toll on mental health. Although not related to climate change, following the 2004 tsunami disaster, 14–39% of children in coastal communities in Sri Lanka suffered from post-traumatic stress disorder. Extreme weather events associated with climate change may have similar impacts.

**Heat-related illnesses and deaths**

Global warming is projected to increase the frequency of heat waves and decrease the frequency of winter cold spells. Rapid urbanization is an important cause of increasing temperature – producing “urban heat island” effects; as 60% of the global populations are projected to live in cities by 2030. This will increase the total population exposed to extreme heat.

Heat exposure has a range of health effects, from mild heat rashes to deadly heat stroke; it also aggravates several chronic diseases, including cardiovascular and respiratory disease. The 2006 United States heat wave killed 139 humans in California. Also, heat-related deaths were reported from Chicago earlier. A study of 10 Canadian cities suggested that in Montreal for example, heat-related deaths would increase from 70 per annum to 240–1140 in an “average” summer in 2050 without acclimatization. Past human influence on climate could be responsible for at least half the risk of the 2003 European heat-wave that caused 22,000-35,000 excess deaths. The 2010 intense heat wave in western Russia was the most extreme in the instrumental record since 1880 for that region and an increase of heat waves in the future has been predicted.

The relationship between increased mortality and low temperatures is more complex than that with high temperatures. Thus, the degree to which cold-related deaths in temperate countries may decline with global warming is unresolved.

**Water- and food-borne illnesses**

Water-borne infectious diseases are also heavily affected by climate change. Both
flooding and shortages of water can derange the sanitation system and quality and quantity of available water, especially in poor areas. In Bangladesh, cholera cases increased by both high and low rainfalls which, along with higher temperature, also increased non-cholera cases. Studies from India also showed a relationship between number of cholera cases and rainfall anomalies. In Fiji, diarrhoea reports among infants increased by 2% per unit increase in rainfall and by 8% per unit decrease in rainfall. When the temperature variable was lagged by 1 month, there was approximately a 3% increase in diarrhoea cases per degree increase in temperature in the previous month. Similar associations have been observed in many other developing country settings.

Several recent papers discussed the effects of El Niño on diarrhoeal diseases. A marked increase in the number of cases of diarrhoea and dehydration in infants and young children was observed in Lima, Peru, during an El Niño event; others also described increased hospitalizations due to childhood diarrhoea during such events.

Climate change may have both direct and indirect impacts on the occurrence of food safety hazards at various stages of the food chain. Climate change affects the microbial population of the macro-environment (soil, air and water) and the population of pests or other vectors, thereby contributing to the occurrence of diseases attributable to fungi, bacteria, viruses and insects. Factors such as nutrient deficiencies, air pollutants and temperature/moisture extremes also affect plant health and productivity. Evidence of the impact of climate change on the transmission of food and water-borne diseases comes from a number of sources, e.g. the seasonality of food-borne and diarrhoeal diseases, changes in disease patterns (e.g. salmonellosis and campylobacteriosis) that occur as a consequence of temperature, and associations between increased incidence of food- and water-borne illness and severe weather events.

**Vector- and rodent-borne diseases**

Climate change is expected to have a pronounced effect on vector-borne diseases such as malaria or dengue fever, with visible effects in areas where the diseases are newly introduced and people have little resistance built up. Global warming will extend favourable zones for vectors. For example, in Africa, this will often be at higher elevations that were formerly too cold to support these diseases. A warmer environment boosts the reproduction rate of mosquitoes and the number of blood meals they take, prolongs their breeding season, and shortens the maturation period for the microbes they disperse. In poorer countries, this may simply lead to higher incidence of such diseases. Populations living at the present margins of malaria and dengue, without effective primary health care, will be the most susceptible if these diseases expand their geographic range in a warmer world.

Rough models of the spread of malaria affected by global warming show that malaria prevalence may increase by 50 million to 80 million cases per year with an associated 3°C rise in average global temperature by the year 2100. In India, studies indicated that in the 2050s, malaria is likely to persist in eastern India, while it may shift from the central Indian region to the south western coastal states. Also the northern states may become malaria prone in the future climate change regime. Similarly, increases in the incidence of malaria and/or a shift to newer areas will also occur in many countries in the African region, where malaria accounts for about 10% of the total disease burden.
Changes in temperature also affect breeding and dwelling habits of other vectors such as flies and ticks, while changes in precipitation affect the range and distribution of these vectors. Thus, other vector-borne diseases such as schistosomiasis, Chagas disease, sleeping sickness, river blindness, and encephalitis all could change their ranges and patterns of infection in the course of climate change. For example, recent modelling of the response of schistosomiasis to current global warming trends suggests that an additional five million cases will appear per year by 2050.

**Air pollution-related health effects**

Usually, air pollution is differentiated into three broad categories: ambient, indoor and trans-boundary. All three types are strongly affected by climate—precipitation, wind, temperature, radiation—and thus by changes in climate. At the same time, air pollution is thought to be one of the major contributors to the present situation of “climate change”. Worldwide, the World Health Organization (WHO) estimates that as many as 1.4 billion urban residents breathe air with pollutant concentrations exceeding the WHO air guideline values.

Although the causes and consequences of air pollution are often localized, transboundary movement of air pollutants has regional as well as global implications. Acid deposition, global climate change, and stratospheric ozone depletion are among the emerging issues that transcend political boundaries.

Air pollution results from the combination of high emissions and unfavourable weather. The two air pollutants of most concern for public health are surface ozone and particulate matter. Transport is one of the main sources of air pollution, for which evidence on direct effects on mortality as well as on respiratory and cardiovascular disease is firmly established. The combustion of fossil fuel leads to emissions of greenhouse gases (GHGs), particularly carbon dioxide, in addition to conventional air pollutants like carbon monoxide, volatile organic compounds, carbonaceous aerosols (“soot”), nitrogen oxides and sulphur dioxide. Some of these compounds react in the atmosphere to form secondary pollutants such as ozone, particulate sulphate, nitrate and organic matter, producing impacts on ecosystems and human health.

**Allergic disorders**

Climate change will affect air quality, including production and allergenicity of aeroallergens such as pollen and mold spores, and increases in regional ambient concentrations of ozone, fine particles and dust. Some of these pollutants can directly cause or exacerbate respiratory disease in susceptible individuals. Precipitation-affected aeroallergens such as mold spores may cause respiratory allergic airway symptoms in 5% individuals over their lifetime.

**Storm surge-related drowning and injuries**

Atlantic tropical storm and hurricane destructive potential as measured by the Power Dissipation Index (which combines storm intensity, duration and frequency) has increased substantially over the past 50 years in association with warming Atlantic sea surface temperatures. It is very likely that human-induced increase in greenhouse gases has contributed to the increase in sea surface temperatures in the hurricane formation regions. Analyses of model simulations suggest that for each 1ºC increase in tropical sea surface temperatures, the core rainfall rates will increase by 6-18% and the surface wind speeds of the strongest hurricanes will increase by about 1-8%. This may result in
huge loss of lives and serious injuries among people along with damages to infrastructure in affected areas.

Effects on nutrition
Food-borne illness and food insecurity, both likely outcomes of climate change, may lead to malnutrition. While adult humans exposed to mild famine usually recover quite well when food again becomes plentiful, nutritional reductions to a fetus in the womb appear to have lasting effects throughout life. Malnutrition and under-nutrition in pregnant women are a global cause of low birthweight and other poor birth outcomes that are associated with later developmental deficits.

Drought has been shown to encourage crop pests such as aphids, locusts and whiteflies, as well as the spread of the mold Aspergillus flavus that produces aflatoxin, a substance that may contribute to the development of liver cancer in people who eat contaminated corn and nuts.49 The spread of agricultural pests and weeds may lead to the need for greater use of some toxic chemical herbicides, fungicides and insecticides, resulting in potential immediate hazards to farm workers and their families, as well as longer-term hazards to consumers, particularly children.

Health problems of displaced populations
It is also highly likely that the long-term effects of climate change will displace significant numbers of people, many of whom are already vulnerable members of society. Extreme weather events, sea-level rise, destruction of local economies, resource scarcity, and associated conflict due to climate change are predicted to displace millions of people worldwide over the coming century. By 2050, 200 million people may suffer from climate change-related displacements;50 in 2008, Asia was the most affected continent with more than 30 million people displaced due to natural disasters.51 In addition, people will continue to experience place-based distress caused by the effects of climate change due to involuntary migration or the loss of connection to one’s home environment, a phenomenon called “Solastalgia”.

Strategies to reduce/prevent health impacts of climate change
The health risks associated with climate change call for a broad spectrum of policy responses and strategies at local, regional, national and global levels. According to the United Nations Framework Convention on Climate Change (UNFCCC), the two fundamental response strategies include mitigation and adaptation. The mitigation processes intend to limit climate change by reducing the emissions of GHGs whereas adaptation aims to alleviate the adverse impacts through a wide range of actions.

Mitigation strategies
In general, mitigation policies are developed in response to a perceived risk of climate change impacts. However, deciding on a proper response involves a lot of uncertainties due to lack of complete and reliable data on specific risks.52 The mitigation strategies mostly involve identification and selection of actions to reduce GHG emissions. Since these emissions are strongly tied to human activities that support life systems, it is necessary that such strategies should promote sustainable and equitable development while reducing the concentration of GHGs. This is a major challenge because of diversities in responsibility and obligations and developmental needs of countries around the world. For example, industrialized countries have only 25% of the world’s population but are responsible for most of the current and past global GHG emissions including 75% of carbon dioxide
emissions. However, a large number of tools and techniques are available that can assist countries and regions to determine the appropriate strategies. Of course they will need to be continuously adapted so as to overcome the numerous barriers and threats that remain in implementing actions to mitigate the negative effects of climate change.

Limiting carbon dioxide emissions is central in reducing GHG emissions. Carbon dioxide is emitted to the atmosphere by three main sources - energy production and use (contributes over 70% of the total), industrial activities and land use changes. Current trends show that energy demand will continue to increase for most countries of the world in the future. In developing countries it is due to the need to overcome poverty and cope with high population growth, while in newly industrialized countries it is due to the tendency to replicate past energy use patterns of industrialized countries. The Inter-government Panel on Climate Change (IPCC)’s Special Report on Renewable Energy Sources and Climate Change Mitigation (SRREN) noted the significant potential of renewable energy to mitigate climate change and to provide wider benefits. Several studies assessed how greenhouse gas mitigation measures in the electricity generation sector can benefit health due to changes in particle air pollution emissions. It was observed that health benefits greatly offset costs of GHG mitigation, especially in India where pollution is high and costs of mitigation are low. As mentioned previously, the threat of climate instability will have impacts that no single country alone can solve.

**Adaptation strategies**

Adaptation to the adverse effects of climate change is vital in order to reduce the impacts of climate change that are happening now and to increase resilience to future impacts. Proper adaptation requires natural resource management, enhancing food security, development of social and human capital and strengthening of institutional systems. Such processes, besides building the resilience of communities, regions and countries to adverse climatic impacts, are good development practice in themselves.

Successful adaptation not only depends on governments but also on the active and sustained engagement of different stakeholders. Adaptation strategies that are community-based can greatly benefit from knowledge of local coping strategies. For instance, the National Adaptation Programmes of Action (NAPAs), which are based upon existing information and community-level inputs, provide an important way to prioritize urgent and immediate adaptation needs for the least developed countries. However, to take adaptive measures, most of these countries would require international assistance in terms of funding, technology transfer and capacity building.

Since health care is a major economic sector worldwide and major health organizations, including WHO, hold that climate change is a major public health concern, the health sector has to take a leadership role to address mitigation and adaptive issues. The adaptive measures include public health response to changing patterns of disease transmission and natural disasters, such as setting up effective surveillance and response systems, formulating integrated measures for rapid response after natural disasters, and strengthening institutional capacity including procurement of necessary and sufficient supplies. The mitigation measures, on the other hand, may include activities like building energy-efficient facilities, use of natural ventilation and daylight, on-site rainwater capture and treatment, appropriate waste/
sewage treatment, improving access to health care by mass transport and expanded use of tele-health. For example, rainwater harvesting is one conservative measure widely promoted in the WHO South-East Asia Region.57

Some of the most effective actions by health professionals will nevertheless involve supporting other sectors’ efforts to mitigate and adapt to climate change. The ultimate goal of the public health community, however, should go beyond reacting to a changing climate. A true preventive strategy needs to ensure the maintenance and development of healthy environments, since in the long term sustainable development and protection of ecosystem are fundamentally necessary for human health.

References

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Escherichia coli contamination of babies’ food-serving utensils in a district of West Sumatra, Indonesia

Aria Kusuma a, Tris Eryando a & Dewi Susanna a

Background: Contamination of baby’s complementary food may occur with Escherichia coli from several sources including unclean utensils. We examined the relationship between socio-economic conditions, environmental factors, characteristics of food handlers and contamination of babies food-serving utensils with E. coli.

Methods: The study was conducted in 21 villages of the Community Health Centre (CHC) Selayo in Indonesia. A cross-sectional design was used. A sample of 142 households, which had a 6-12 month-old baby on complementary food, was chosen randomly using midwives’ registration books. Respondents were interviewed using a semi-structured questionnaire. Check-lists were used for observations. Standard laboratory methods were used for collection of specimen and confirmation of contamination with E. coli.

Results: More than half of the respondents (59.2%) used water that had high risk of contamination and 61.3% of the latrines did not meet the criteria of a healthy latrine. Waste management practices of nearly all respondents (97.9%) were below the standards set by the Ministry of Health. More than half of the respondents (68.3%) did not wash their hands with soap for 20 seconds and 52.1% did not use flowing water for washing hands. Majority of the respondents’ hands (57%, 81/142) and 72.2% (104/142) of the eating utensils were found to be contaminated by E. coli. Contaminated hands of food handlers were more likely to contaminate the babies food-serving utensils (OR: 3.7; 95%CI: 1.62-8.46, p 0.002).

Conclusion: Contamination of the hands of food handler was associated with contamination of babies food-serving utensils by E. coli. Hence, food handlers should be trained on proper hand washing methods.

Key words: Infant, complementary food, utensil, Escherichia coli, sanitation, Indonesia.

Introduction

The contamination sources of a baby’s complementary food may include unclean utensils used during complementary food preparation, domestic animals, fresh water, waste water, irrigation water, animal products, infectious human and animal waste, food handlers (through unhygienic hands), flies, pests and environment (dirt or dust).1,2 The hygienic condition of a baby’s eating utensils, as one of the contamination sources of complementary food, may also be responsible for diarrhoea in babies.

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A preliminary study in the operational area of the Community Health Centre (CHC) Selayo, had found good coverage with clean water and latrines (87.7% and 63% respectively) but 70% of the respondents were washing their baby’s eating utensils in the bathroom. In addition, none of the respondents washed their hands before preparing homemade complementary foods. This information indicated a possibility of contamination of utensils by the food handlers. Thus, we conducted a study on E. coli contamination of the complementary food serving utensils. The relationship of E. coli contamination of a babies food-serving eating utensils with the method of handling of babies food-serving utensils, sanitation condition of the environment, characteristics of the food handlers and socio-economic condition of the respondent were also examined.

**Methods**

This study was conducted in the operational area of the Community Health Centre (CHC) Selayo, in Solok District, West Sumatra, Indonesia. Data were collected from December 2009 to February 2010. Ethical clearance was obtained from the Ethic Commission of the Public Health Faculty, University of Indonesia. Every respondent provided informed consent to the surveyor.

The households that had a baby aged 6-12 months were chosen randomly from the registry book of Jorong (village) midwives, i.e. babies with even registration numbers. The sample size for each Jorong was determined by the proportion of babies in the respective Jorong. A sample size of 97 was estimated based on the assumed contamination level of 50% for the eating utensils and precision of 10%.

Eighteen graduates of the Environmental Health Study Programme from the Padang Health Polytechnic collected the data. They had experience in food microbiology including E. coli examination, and had a general understanding about the interview methods and specimen taking technique. Prior to the data collection process, all surveyors were also trained by the Public Health Laboratory Officers from Padang on the technique of taking microbiology samples using aseptic methods and by the research team from the Faculty of Public Health, University of Indonesia for interview technique. The data collection instruments included questionnaires and check lists.

A total of 284 sample swabs were examined in the Health Ministry’s Provincial Health Laboratory (PHL) in Padang. These sample swabs consisted of 142 swabs from the eating utensils and 142 swabs from hands of the food handlers. The eating utensil swabs were collected from the plates and spoons used in serving complementary food. Ministry of Health procedures for microbiology of food utensils and hand swabs samples were used.

The samples were immediately sent to the laboratory. Sample bottles were put inside a cold box equipped with cold packs in order to keep the temperature below 5°C until their arrival at the laboratory. The method of taking swabs, transportation and processing of the samples in the laboratory was similar for the specimen taken from the hands of food handlers and from the feeding utensils.

The stages of E. coli confirmation in the laboratory were as follows:

**Presumptive test**

Test tubes and different media inside the tubes were sterilized. Bacterial seeding was conducted inside a test tube which consisted of 3 series tubes, each of the 3 tubes along with
Durham tubes were inserted upside down in each test tube. Each test tube was filled with 10 cc lactose broth (LB) medium. The top layer of the clear liquid, which resulted from the milling or blending of the food samples, was added into each tube (10 cc, 1 cc and 0.1 cc) using aseptic method. The tube series were then incubated at 37°C for 24-48 hours. The existence of coliform bacteria was indicated by the shift of colour of LB medium from orange (purple) into yellow, which was accompanied by the production of gas, observable inside the Durham tube. The next step was to read the result of the estimated quantity of coliform bacteria based on the table of the Most Probable Number (MPN) from the combination of the positive result from the three incubation tube series.4

Confirmation test

The examination of faecal coliform and E. coli bacteria was conducted by putting one full loop of the identified coliform bacteria into the tube series containing sterilized Brilliant Green Lactose Bile (BGLB) 2% along with Durham tubes which were inserted upside down. The quantity of the tube series that were used in analyzing faecal coli and E. coli bacteria conformed to the quantity of the positive tube series during the examination of coliform bacteria (presumptive test). The tubes were then incubated at 44.5°C for 24-48 hours. They were labelled positive if there was fermentation of the medium indicated by the colour shift of the medium from dark green into light green or yellow and observation of gas inside the Durham tubes. The MPN number of faecal E. coli bacteria was read in the MPN table based on the number of positive tubes from the incubated BGLB tube series.4

To maintain the required temperature, surveyors placed every sample into a cold box and carried these in a car. After all samples were collected old cold packs were replaced with the new ones in CHC Selayo or in the Office of Health, Solok District. Later these were taken to PHL Padang. This way the temperature was kept under 5°C until all samples reached PHL Padang.6-7 Considering that the research location was prone to disaster and unexpected events such as electrical failure etc., two samples were taken. One of these samples was used as a back-up. Quality control included testing of 10% of the samples twice at the Primary Health Centre, Padang and Jakarta.

Statistical analysis

The dependent variable used in this study was E. coli contamination on the utensils used for serving complementary food to babies in the age group of 6-12 months. The independent variables were: (i) Environmental factors - the contamination risk level of clean water facility, family latrine condition, condition of waste water drainage, trash disposal and animals inside the house; (ii) Food handlers’ characteristics included educational background, type of eating utensils used, knowledge on how to wash eating utensils, washing methods used for eating utensils and hygiene level of the hands (E. coli contamination); and (iii) Socioeconomic condition of the family including parents’ educational background, mothers’ profession, parents’ monthly income and mothers’ parity.

The data were entered into a database. After cleaning the data, univariate analysis was done to describe study variables. The frequency distribution of each variable for the nominal and ordinal scale and the mean and median value of the interval and ratio scale were examined. Bivariate analysis was carried out to observe whether there was a relationship between the dependent
and independent variables. Chi-square test was used with the significance level of 0.05. Multivariate analysis was conducted to determine risk factors (several independent variables) that have a statistically significant relationship with the dependent variable using logistic regression analysis. All variables that were having a chi-square test p value of <0.25 in the bivariate analysis were included in the logistic regression model.

**Results**

More than half of the parents (69%) were highly educated (high school or more), and 72.6% of the mothers were housewives, which is categorized as a low risk occupation. Family income exceeded Indonesian Rupiah 600 000 (approximately US$ 70.59) per month in 26.8% of the respondents. More than half of the mothers (59.9%) were in low risk category since they had delivered less than two children.

The observations of environmental factors revealed that more than half of the respondents (59.2%) used a clean water facility that had high contamination risk. The house latrine condition showed that more than half (61.3%) of the latrines had lower than the mean values of the standards required for a healthy latrine. Furthermore, waste management conditions of nearly all respondents (97.9%) did not meet the requirements set by the Ministry of Health.

More than half of baby food handlers (56.3%) were highly educated (high school or more). All food handlers (97.2%) used glass plates and stainless steel spoons for feeding the baby. More than half of them (70.4%) had good knowledge about how to wash eating utensils. Good knowledge meant that they scored more than the median value on 5 knowledge questions related to the washing of eating utensils. More than half of the food handlers (64.8%) washed eating utensils with a low risk method based on the median value of observation check list for 5 stages of hygienic washing method. However, only 35.2% had demonstrated correct washing methods. More than half (57%, 81/142) of the food handlers’ hands were found to be contaminated by *E. coli*.

Univariate analysis revealed that 72.2% (104/142) of the baby’s eating utensils were contaminated by *E. coli*. As shown in Table 1, in bivariate analysis only food handlers’ hands hygiene was found to be statistically associated with *E. coli* contamination on the baby’s eating utensils (OR: 3.1; 95% CI: 1.4-6.7 p 0.006). In the multivariate analysis that included four variables having p value < 0.25 in bivariate analysis, hand hygiene was found to be associated with *E. coli* contamination on the baby’s eating utensils (OR: 3.7; 95% CI: 1.62-8.46 p 0.002) as shown in Table 2. There was no statistical interaction between the five variables included in the model such as education with hand hygiene, education with eating utensils method and parents’ education with eating utensils method.

**Discussion**

Food handler’s hand hygiene was significantly associated with *E. coli* contamination on the baby’s eating utensils. Contamination of hands with *E. coli* was 3.7 times more likely to lead to *E. coli* contamination on baby’s eating utensils compared to the uncontaminated hands of the food handlers. High risk basic sanitation facilities, low risk socioeconomic status, and low risk utensil washing method did not have an association with *E. coli* contamination of utensils. Bad hand hygiene has been reported in other studies. A study in Chandigarh, India, revealed that 79% of mothers’ fingers
Table 1: Association of socio-environmental variables with *E. coli* contamination on babies’ food-serving utensils

<table>
<thead>
<tr>
<th>Variables</th>
<th><em>E. coli</em> contamination on eating utensils</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Yes n (%)</strong></td>
<td><strong>No n (%)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Clean water facility</td>
<td><strong>High risk</strong></td>
<td><strong>Low risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>63(75.0)</td>
<td>41(70.7)</td>
<td>1.24</td>
<td>0.59-2.64</td>
</tr>
<tr>
<td>Family latrine condition</td>
<td><strong>High risk</strong></td>
<td><strong>Low risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>64(73.6)</td>
<td>40(72.7)</td>
<td>1.04</td>
<td>0.49-2.23</td>
</tr>
<tr>
<td>Waste water drainage</td>
<td><strong>High risk</strong></td>
<td><strong>Low risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>97(72.4)</td>
<td>7(87.5)</td>
<td>0.38</td>
<td>0.05-3.15</td>
</tr>
<tr>
<td>Waste management</td>
<td><strong>High risk</strong></td>
<td><strong>Low risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>101(72.2)</td>
<td>2(66.7)</td>
<td>1.33</td>
<td>0.12-15.12</td>
</tr>
<tr>
<td>Pets ownership</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>44(74.6)</td>
<td>60(72.3)</td>
<td>1.12</td>
<td>0.53-2.40</td>
</tr>
<tr>
<td>Education of food handler</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>42(67.7)</td>
<td>62(77.5)</td>
<td>0.61</td>
<td>0.29-1.29</td>
</tr>
<tr>
<td>Type of eating utensils used</td>
<td><strong>High risk</strong></td>
<td><strong>Low risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3(75.0)</td>
<td>100(72.5)</td>
<td>1.14</td>
<td>0.12-11.30</td>
</tr>
<tr>
<td>Knowledge on the eating utensils washing</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>33(78.6)</td>
<td>71(71.0)</td>
<td>1.45</td>
<td>0.64-3.52</td>
</tr>
<tr>
<td>Eating utensils washing method</td>
<td><strong>High risk</strong></td>
<td><strong>Low risk</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>41(82.0)</td>
<td>63(68.5)</td>
<td>2.10</td>
<td>0.90-4.9</td>
</tr>
<tr>
<td>Hand Hygiene</td>
<td><strong>Contaminated</strong></td>
<td><strong>Uncontaminated</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>67(82.7)</td>
<td>37(60.7)</td>
<td>3.10</td>
<td>1.44-6.72</td>
</tr>
<tr>
<td>Parents’ education</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>31(70.5)</td>
<td>73(74.5)</td>
<td>0.88</td>
<td>0.37-1.80</td>
</tr>
<tr>
<td>Parents’ occupation</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>29(74.4)</td>
<td>75(72.8)</td>
<td>1.08</td>
<td>0.45-2.52</td>
</tr>
<tr>
<td>Parents’ income</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>26(68.4)</td>
<td>78(75.0)</td>
<td>0.72</td>
<td>0.32-1.63</td>
</tr>
<tr>
<td>Parity</td>
<td><strong>High</strong></td>
<td><strong>Low</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>39(68.4)</td>
<td>65(76.5)</td>
<td>0.67</td>
<td>0.32-1.41</td>
</tr>
</tbody>
</table>

* by *E. coli*
were contaminated by *E. coli*. A research in Viet Nam also discovered that 69.9% of the respondents did not always wash their hands with soap before they prepared meals. Another qualitative study by Usfar in Tangerang found that 71% of the respondents did not wash their hands with soap after preparing foods such as meat, fish, and chicken. A study at Kampong Chhnang and Kampong Thom, Cambodia, also found that nine out of ten food handlers washed their hands with water only when they prepared a meal, and only a third of them washed their hands with soap, but one out of four food handlers did not wash his/her hands after having contact with raw food.

In Baroda, India half of the mothers of the observed households (50%) had poor hygiene level, based on the observation of an indicator of mother’s nail hygiene. About 30% of them had their nails contaminated by *E. coli*. Food handlers’ hands hygiene is an important factor for minimizing baby’s contamination of eating utensils. Washing hands would not straight away minimize the risk because how they wash their hands is also an important factor. Even though food handlers may wash babies’ utensils in the right way, bad hand hygiene is a risk factor that must be controlled to minimize *E. coli* contamination of the utensils.

The main limitation of the study was that the utensils from where swab samples were taken had been washed before the surveyor came to the household. Food handlers may not have cleaned the utensils in the right way, but they did it better when the surveyor observed them. This is a limitation of cross-sectional design. We did not examine water quality in this study using laboratory methods, but categorized contamination risk of water facilities by using sanitation inspection tools (Ministry of Health Sanitation Inspection check list). Most water facilities were found to be of low risk. In future studies, the researcher should include objective microbiological criteria for water quality. We did not find an association of community socioeconomic conditions with the dependent variables. All respondents lived in almost the same culture, income and education category; their condition was almost the same in each household. Another limitation was that the MPN test, meant for quantitative assay of *Coliforms* in drinking water, was used for a qualitative assay for the presence of *E. coli* on utensils and hand swabs. Many confounding variables, including the area swabbed, volume of diluent used and the quantitative criteria for safe and unsafe contamination can affect the results of the MPN test which is primarily standardized for drinking water.

High risk sanitation facilities could be the entry point of *E. coli* contamination. *E. coli* live as normal flora in the digestive tracts of mammals including humans. High risk excreta disposal facilities and waste water facilities could be the contamination sources of clean

### Table 2: Multivariate analysis of socio-environmental risk factors associated with *E. coli* contamination

<table>
<thead>
<tr>
<th>Variables</th>
<th>Odds Ratio</th>
<th>95% Confidence Interval</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food handler education –high</td>
<td>0.3</td>
<td>0.13-0.85</td>
<td>0.02</td>
</tr>
<tr>
<td>Food handler’s hands contaminated by <em>E. coli</em></td>
<td>3.7</td>
<td>1.62-8.46</td>
<td>0.002</td>
</tr>
<tr>
<td>Parent’s education -low</td>
<td>2.7</td>
<td>1.08-6.71</td>
<td>0.04</td>
</tr>
</tbody>
</table>
water. Contaminated clean water used for washing babies’ eating utensils and hands could be a contaminant too. Low risk eating utensils washing methods could minimize the risk of *E. coli* contamination on eating utensils but contaminated hands could re-contaminate it. According to WHO, the eating utensils used for four to six month-old babies when they start to consume complementary food could potentially increase the risk of contamination, especially by *E. coli*, caused by the lack of hygienic management of the babies’ eating utensils in developing countries. Hygienic management of babies’ eating utensils and hands hygiene must be improved together to reduce that risk of *E. coli* contamination of eating utensils.

To conclude, high risk sanitation facilities, low risk socioeconomic conditions, and low risk utensil washing method were not found to be associated with contamination of babies’ food-serving utensils. The most significant contributory factor was found to be food handlers’ hand hygiene. Food handlers’ hand hygiene should be improved to reduce the risk of *E. coli* contamination on the eating utensils of the baby.

**Acknowledgements**

We thank the Directorate of Research and Community Service of the University of Indonesia for Doctoral Research Grant contract No. 7550/DRPM-UI/B/N1.4/2009. We would also like to thank Professor Haryoto Kusnoputranoto, DrH as Promoter, Professor Dr I Made Djaja as Co-promoter-1, Professor Dr Rizal Syarief as Co-promoter-2, and Professor Dr Sudarto Ronroatmodjo, Professor Dr Kusharisupeni, Dr Saptawati Bardosono, Dr Ririn Arminshih Wulandari, Dr Anies Irawati as examiners. Special thanks are also due to Mawarta Onida for her help in editing this manuscript.

**References**


Prevalence and predictors of self-medication in a selected urban and rural district of Sri Lanka

Pushpa R Wijesinghe\textsuperscript{a}, Ravindra L Jayakody\textsuperscript{b}, Rohini de A Seneviratne\textsuperscript{c}

\begin{tabular}{|l|}
\hline
\textbf{Background:} Self-medication is widely practised in many developing countries. The determinants of self-medication need to be understood to design adequate medicine information policies and patient-dispenser education strategies. Hence, the prevalence of medicine use and predictors of self-medication were determined in Sri Lanka. \\
\textbf{Methods:} In a community-based cross-sectional study, data were collected from 1800 adults selected from Gampaha and Polonnaruwa districts respectively. Study participants were sampled using a multistage cluster sampling technique. Trained public health midwives administered the questionnaire. Two Likert scales provided information on access to medical care and satisfaction with available pharmacy services. About 95\% of the sampled population participated in the study. \\
\textbf{Results:} Overall, prevalence of medication use (allopathic, traditional, home remedies) in urban and rural population was 33.9\% and 35.3\%, respectively. Self-medication prevalence of allopathic drugs in the urban sector (12.2\%) was significantly higher than in the rural (7.9\%) sector (p<0.05). In the urban sector, small household size and preference to have medicines from outside the pharmacies predisposed to self-medication. The higher acceptability of medical services and regularity of medical care decreased the likelihood of self-medication. In the rural sector, lower satisfaction about the healthcare providers’ concern for clients, lower satisfaction about affordability of medical care and higher satisfaction with technical competence of the pharmacy staff increased the likelihood of self-medication. In both urban and rural sectors, when symptom count increased, tendency to self-medicate decreased. \\
\textbf{Conclusions:} Self-medication prevalence was higher in urban compared to rural areas in Sri Lanka. Some aspects of access to medical care, satisfaction with pharmacy services and perceived severity of the disease were found to be important determinants of self-medication. \\
\textbf{Key words:} Prevalence, predictors, self-medication, prescribed medication, access. \\
\end{tabular}

\section*{Introduction}

Self-medication, despite its negative outlook by some, is regarded as an important component of primary health care (PHC). It is a common practice even in places where health professionals are easily accessible. Self-medication gets enhanced with increasing literacy and it is even encouraged so as to have self-reliance for curative, preventive, promotive and rehabilitative care.\textsuperscript{1} If practiced correctly, it may save expenses of health care seekers. Thus, considering the usefulness of

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self-medication, the World Health Organization (WHO) has developed guidelines for regulatory assessment of the medicines appropriate for self-medication.2

Self-medication is a common practice to treat most episodes of illnesses in economically deprived communities.3,4 It is explained by the reduced demand for doctor consultations and subsequent costs for treating perceived self-limiting conditions.5 Prevalence of self-medication in developing countries is in the range of 12.7% to 95%.6,7 Estimates vary in the South-Asia Region. In Nepal, self-medication was 59% in the six-month period preceding the interview8 while the estimate in India was 31%.9 A wide variation has been reported in India. For example, in coastal regions of South India, the prevalence was 71%.10 In Pakistan, self-medication prevalence was around 51%.11 A study in Bangladesh revealed that for three most frequently reported illnesses, 81.3% of the young and 78.5% elderly health care seekers self-medicated.12

Self-medication is more common among women, young people, those living alone, individuals of low socio-economic status (SES), sufferers of chronic ailments and psychiatric conditions.8,13 Poor SES, high medicine cost, non-availability of doctors in rural areas make health care inaccessible and consequently, pharmaceutical outlets serve as the first contact point of health care. In this context, pharmacists, pharmacy assistants, compounders and health assistants become instrumental in fostering self-medication.8,14,15

In an urban setting of Sri Lanka nearly 64% of the households were reported to have practiced self-medication. In these households, for nearly one third of acute illnesses, self-medication acted as a source of care.16 Even mothers who self-medicate their children were as high as 85% in an urban area.17 Most studies in Sri Lanka were confined to urban areas which have well developed health and pharmaceutical care networks. Proxy indicators such as self-medication prevalence for malaria indicate that self-medication is relatively low in rural areas.18

Self-medication is a self-initiated behaviour.15 Hence, knowledge on behavioural aspects related to medication use is required to improve and expand the knowledge base on health care seeking behaviour. Users’ subjective evaluation of behaviour-related variables has been identified as important.19 Hence, perceived satisfaction with health care service and access to care could have a strong association with medication use. However, an analytical epidemiological approach has not been applied in determining significant predictors of self-medication in community–based medication use studies in urban and rural settings in Sri Lanka. Therefore, a community-based, cross-sectional study was conducted to determine the prevalence of medicines use and predictors of self-medication among adults.

**Methods**

**Study area**

The estimated mid-year population of Sri Lanka was 20.7 million in 2010.20 The country has nine provinces and 25 administrative districts. We selected all urban/municipal council areas of the Gampaha district in the Western Province and exclusively agrarian Polonnaruwa District in the North Central Province to conduct this community-based cross-sectional study. These two non-adjacent districts differ in terms of provision of health/pharmaceutical care. In Gampaha district people have access to a wide variety of public and private health/pharmaceutical care facilities while Polonnaruwa district has very few health/pharmaceutical facilities. The ethical clearance
to conduct the study was granted by the Ethical Review Committee of the Faculty of Medicine of the University of Colombo.

**Study population selection**

The study population comprised of adults over 18 years of age, residing in respective districts for a period of at least one year. The sample size was calculated using the formula for estimating the difference between urban and rural prevalence of medication use with a specified absolute precision. The prevalence was assumed to be 50% in order to obtain the largest possible sample. The estimated sample size was 769 for an absolute precision of 5%. To account for a possibility of non-response, estimated sample size was increased to 846. This sample size was multiplied by a design effect of two as we used the cluster sampling technique. Thus, the required sample size was 1692 (846 each from urban and rural sectors).

Study participants were selected from 60 clusters (30 clusters from each urban and rural sector). The cluster size was 30 participants. Clusters were selected in a multi-stage, probability proportionate to size (PPS) sampling procedure. A Grama Niladhari (GN) division served as the primary sampling unit (PSU). GN division, a geographically well demarcated unit, is the lowest administrative division in a district in Sri Lanka. Within each PSU, 30 households were randomly selected using the voters’ lists. The household member eligible for the survey was selected using a Kish table.

**Study tools**

Data was collected using a pre-tested questionnaire, which was administered by 15 trained Public Health Midwives (PHM) during a face-to-face interview. The English questionnaire was translated to Sinhala and Tamil languages. The data were collected on medication use (allopathic medicines, traditional or home remedies) by self or prescribed by doctors during the preceding two weeks prior to the interview. The socio-demographic details of study subjects and their attitudes towards medicines were also assessed. Other variables included information on the health status, morbidity status and the number of symptoms at the time of medication use.

In addition to the questionnaire, study participants completed two self-administered Likert-type scales to obtain information on selected domains of perceived satisfaction with private pharmacy services (scale I) and access to medical care (scale II). Instead of the conventional translation and back translation which is considered inadequate for ethnographic research, we used the combined qualitative and quantitative approach for translation suggested by Sumathipala and Murray.

The first Likert scale used for assessing the satisfaction with private pharmacy services was adapted from the scale prepared by MacKeigan and Larson which was validated for local use. This scale contained domains namely access to services, continuity with the same pharmacy services, availability of medicines, affordability of medicines, perceived efficacy of medications, general satisfaction, interpersonal aspects (explanations, considerateness) and technical competence of the pharmacy staff. These domains contained 41 items. The scale was validated using 178 clients of four private pharmacies and six hospital out-door pharmacies in Colombo and Anuradhapura districts. The construct validity was assessed using confirmatory factor analysis, item analysis and by measuring internal consistency. The factors extracted by the principal component analysis accounted for 20.8% of variance. In the defined scales, Cronbach’s alpha exceeded
the expected value of 0.5 or more.\textsuperscript{23} Even if the very stringent Nunally’s criteria is used, three of the scales met the Nunally’s criteria of Cronbach’s alpha exceeding 0.7 (0.8, 0.75, 0.71) while 4 scales were close to 0.7 (0.65, 0.65, 0.67, 0.68).\textsuperscript{25} The inter-scale correlation coefficient of defined scales indicated that only Interpersonal I (explanation), Interpersonal II (considerateness) and general satisfaction which had values falling between Anastasi’s criteria of 0.5-0.7 were the sub-scales of the same theoretical concept while others were independent scales.\textsuperscript{23}

The second Likert scale for assessing the perceived access to medical care had domains of concern for clients, service availability, affordability, acceptability and regularity. This scale of 35 items was prepared on the basis of the theoretical concept of satisfaction by Ware and Snyder\textsuperscript{26} which was validated for local use in the same population used for validating the first scale. Construct validity was assessed using exploratory factor analysis, item-analysis and by measuring internal consistency. Exploratory factor analysis extracted four main factors which accounted for 41\% of variance. All item-scale correlations above 0.3 and the higher correlation of the majority of items (33) with the tentative scale than with other scales confirmed the factor scales. Factor scales were internally consistent as Cronbach’s alpha for all factors (0.51, 0.78, 0.81, and 0.82) exceeded the accepted level of 0.5. None of the dimensions proved to be sub-scales of higher order scales as their inter-scale correlation coefficients did not fall between Anastasi’s criteria of 0.5-0.7.\textsuperscript{23}

Pre-testing of the questionnaire and two scales was carried out on a convenience sample of 30 patients attending a general practice and a medical clinic at a government hospital in Colombo district. The clarity and relevance of items were assessed and certain modifications were made on the basis of the findings of the pre-test.

**Operational definitions**

Medication use was defined as “the use of any pharmaceutical product in any form with or without a prescription in order to cure, prevent, mitigate or diagnose a disease, abnormal physical state, symptom, abnormal physiological condition or to restore, modify or correct organic function in humans”.

We used the WHO definition of self-medication which considered self-medication as “use of pharmaceutical or medicinal products by the consumer to treat self-recognized disorders or symptoms, the intermittent or continued use of a medication previously prescribed by a physician for chronic or recurring disease or symptom, or the use of medication recommended by lay sources or health workers not entitled to prescribe medicine”.\textsuperscript{2}

In order to have a comprehensive pattern of medicines use, information on the use of allopathic medicines, traditional medicines and home remedies was collected. However, detailed analysis was performed on the use of allopathic medicines only.

A recall period of two weeks prior to the interview was used. If the respondent reported use of any medicines in the reference period, they were requested to provide prescriptions, labels, blister packs etc. In case they were unable to provide these evidences, respondents were asked to name the pharmaceutical product and or the purpose of its use. Additionally, the number of drugs, their doses, source of information and condition for which the drugs were used was also recorded.
Statistical analysis

Prevalence of medication use, self-medication, and prescribed medication were considered as dependent variables. Point estimates and 95% confidence intervals were calculated for these variables. When calculating the prevalence of medication use, self-medication and prescribed medication, the total number of study subjects enrolled was used as the denominator. Additionally, we calculated self-medication and prescribed medication as a proportion of the overall medication use also. The denominator for calculating the proportion of self-medication and prescribed medication was the number of subjects in the sample who used any medicine during the two week recall period. The significance of the difference in estimates in two distinct settings was tested using Z test.

‘Predisposing’, ‘enabling’, and ‘need’ variables as defined by Anderson and Newman’s Health Services Utilisation Model\(^2^7\) were used to identify best predictor variables. Pre-disposing (socio-demographic characteristics, beliefs and attitudes) and need variables (health status, chronic conditions and symptoms) were presented as proportions. Values for enabling variables namely domains of perceived access to care and satisfaction with pharmacy services were presented as mean scores with their standard deviations (SD).

In the bi-variate analysis statistical significance of the association was tested using the chi square or Z test. Logistic regression analysis was done using SPSS, version 9.05. Individual scores of access to care and satisfaction with private pharmacy services were categorized as binary variables on the basis of the mean score before including them as categorical variables in logistic regression analysis. The adjusted Odds Ratios (OR) and the 95% confidence intervals (CI) of the predictor variables for self medication were determined separately for urban and rural sectors.

Results

Of the 1800 respondents selected for the study from the two districts, 94.9% participated in the study. Socio-demographic characteristics of the respondents are presented in Table 1. Better education and higher income were observed in the pre-dominantly catholic, industry and service-oriented urban sector as opposed to the pre-dominantly Buddhist and agrarian rural district.

The overall prevalence of medication use (allopathic medicines, traditional medicines and home remedies) in urban and rural sectors was 33.9% (95%CI: 30.7%-37.1%) and 35.3% (95%CI: 32.1%-38.5%) respectively (p 0.5). In both the sectors, among those who had used any medicine in the past two weeks, most had used allopathic medicines (urban 91.4%, rural 84.6%). The users of traditional medicine were significantly higher in the rural (12.4%) than in the urban (3.8%) sector (p 0.0001). Among those who used allopathic medicines, a significantly higher proportion had self-mediated in the urban sector (37%) than in the rural sector (25%) (p 0.002).

The prevalence of allopathic self-medication in urban and rural sectors was 12.2% (95%CI: 10.0%-14.4%) and 7.9% (95%CI: 6.1%-9.7%) (p 0.0001) and prevalence of prescribed allopathic medication was 20.5% (95%CI: 17.8%-23.2%) and 23.1% (95%CI: 20.3%-25.9%) respectively (p >0.05).

Table 2 shows the proportion of self-medication according to selected pre-disposing variables. Self-medication was found to be significantly higher among urban males (46%) than among urban females (33%) (p 0.04).
Table 1: Socio-demographic characteristics of study participants

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Urban sector</th>
<th>Rural sector</th>
<th>p</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>N=863</td>
<td>%</td>
<td>N=846</td>
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<td>Female</td>
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<td>Moor*</td>
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<tr>
<td>Others*</td>
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<td>0.4</td>
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<td><strong>Religion</strong></td>
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<td>Hindu</td>
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<td>Islam</td>
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<td>Christian</td>
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<td><strong>Highest educational level achieved</strong></td>
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<td>Secondary education</td>
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<td>Passed GCE O/L</td>
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<td>33.9</td>
<td>114</td>
</tr>
<tr>
<td>Passed GCE A/L</td>
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<td>17.3</td>
<td>69</td>
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<tr>
<td>Degree, diploma</td>
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<td>1.5</td>
<td>3</td>
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Characteristics &nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&nbsp;&n

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Urban sector</th>
<th>Rural sector</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average monthly income in Rupees (US $)</strong></td>
<td>N=863</td>
<td>N=846</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Less than 2000 (18 $)</td>
<td>69</td>
<td>346</td>
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</tr>
<tr>
<td>2000-4999 (18-45.86 $)</td>
<td>237</td>
<td>304</td>
<td></td>
</tr>
<tr>
<td>5000-9999 (45.87-91.73 $)</td>
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<td>145</td>
<td></td>
</tr>
<tr>
<td>10000-14999 (91.74-137.60 $)</td>
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<td>37</td>
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<tr>
<td>15000-24999 (137.61-229.34 $)</td>
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<tr>
<td>Above 25000 (229.35 $)</td>
<td>19</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

*Categories combined for calculation of χ², Conversion 1 US$ = 109 Sri Lanka Rupees, GSE=General Certificate of Education, OL=Ordinary level, AL=Advanced level.

Table 2: Distribution of selected pre-disposing variables among self-medicated and prescribed medicine users

<table>
<thead>
<tr>
<th>Predisposing variables</th>
<th>Allopathic medicine users</th>
<th>Urban district</th>
<th>Rural district</th>
<th>p</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Self</td>
<td>Prescribed</td>
<td>p</td>
<td>Self</td>
</tr>
<tr>
<td><strong>Sex</strong></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>41(46.1%)</td>
<td>48(53.9%)</td>
<td>0.04</td>
<td>21(22.6%)</td>
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<tr>
<td>Female</td>
<td>64(33.2%)</td>
<td>129(66.8%)</td>
<td>46(27.2%)</td>
<td>123(72.8%)</td>
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<tr>
<td><strong>Age (years)</strong></td>
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<tr>
<td>18-39</td>
<td>42(40.0%)</td>
<td>73(60.0%)</td>
<td>0.7</td>
<td>27(25.4%)</td>
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<tr>
<td>&gt;40</td>
<td>63(37.7%)</td>
<td>104(62.3%)</td>
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<td>116(74.4%)</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;GCE OL</td>
<td>47(33.3%)</td>
<td>94(66.7%)</td>
<td>0.2</td>
<td>56(27.2%)</td>
</tr>
<tr>
<td>&gt;GCE OL</td>
<td>58(41.1%)</td>
<td>83(58.9%)</td>
<td>11(19.6%)</td>
<td>45(80.4%)</td>
</tr>
<tr>
<td><strong>Monthly income in Rupees (US $)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up to 9999 (91.7 $)</td>
<td>78(36.9%)</td>
<td>133(63.1%)</td>
<td>0.8</td>
<td>65(26.7%)</td>
</tr>
<tr>
<td>&gt;10000 (91.74 $)</td>
<td>27(38%)</td>
<td>44(62%)</td>
<td>0(0%)</td>
<td>17(89.5%)</td>
</tr>
<tr>
<td><strong>Accept lay advice about use of medicines</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agree</td>
<td>46(35.6%)</td>
<td>83(64.4%)</td>
<td>0.6</td>
<td>25(23.4%)</td>
</tr>
<tr>
<td>Disagree</td>
<td>59(38.5%)</td>
<td>94(61.5%)</td>
<td>42(27.1%)</td>
<td>113(72.9%)</td>
</tr>
<tr>
<td>No comment</td>
<td>50(36.5%)</td>
<td>87(63.5%)</td>
<td>26(19.8%)</td>
<td>105(80.2%)</td>
</tr>
<tr>
<td><strong>Preference for availability of drugs at places other than pharmacies</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>43(59.7%)</td>
<td>29(40.3%)</td>
<td>0.001</td>
<td>6(21.4%)</td>
</tr>
<tr>
<td>No</td>
<td>62(29.5%)</td>
<td>148(70.5%)</td>
<td>61(26.1%)</td>
<td>173(73.9%)</td>
</tr>
</tbody>
</table>

GCE (OL) = General Certificate of Education (Ordinary level), Conversion 1 US$ = 109 Sri Lanka Rupees
Quite interestingly, in the rural district, those who disagreed to accept lay advice about self-medication were more likely to self-medicate (37.1%) than those who agreed (23.4%) (p 0.02). In the urban sector, those who preferred availability of medicines at informal places other than pharmacies had self-medicated (59.7%) more than those who did not think so (29.5%) (p 0.0001).

Table 3 shows the distribution of medication use by selected measures of access to health care and satisfaction with pharmacy services. Satisfaction scores for interpersonal aspects of “considerateness” (p 0.01) and “providing explanations” (p 0.03) were significantly lower in the self-medication group as compared to users of prescribed medicines in the urban sector. In the rural sector, the score for perceived satisfaction with “technical competence” of the pharmacy staff was significantly higher among the self-medication group than the users of prescribed medicines (p 0.01). When the access to medical care was taken into account, scores in all four dimensions were significantly higher among users of prescribed medicines in the urban sector. However, in the rural sector, only scores for ‘concern for clients’ (p 0.016) and ‘affordability’ (p 0.001) were significantly higher among users of prescribed medication than the self-medication group. Table 4 describes reinforcing variables of medicines use. Among these variables, only the number of symptoms (symptom count) was significantly associated with the type of medicines use in both sectors (p 0.0001).

| Table 3: Distribution of mean (SD) perceived satisfaction with pharmacy services and access to medical care scores among self-medicated and prescribed medicine users |
|-------------------------------|------------------|------------------|------------------|------------------|------------------|------------------|
| **Enabling variable**         | **Urban district** | **Rural district** | **Urban district** | **Rural district** | **Urban district** | **Rural district** |
| **(a) Perceived satisfaction with available pharmacy services** | | | | | |
| Access                        | Self: 20.4(2.9)   | Prescribed: 20.7(2.6) | 0.5 | Self: 16.6(4.0) | Prescribed: 16.4(3.7) | 0.8 |
| Continuity                    | 6.2(1.7)         | 6.4(1.7)         | 0.3 | 5.3(1.7)         | 5.4(1.7)         | 0.4 |
| Drug availability             | 6.8(1.4)         | 6.9(1.3)         | 0.7 | 6.3(1.9)         | 6.5(1.8)         | 0.4 |
| Drug affordability            | 6.4(1.3)         | 6.4(1.4)         | 0.8 | 5.7(1.6)         | 5.8(1.3)         | 0.5 |
| Efficacy of drugs             | 6.7(1.4)         | 7.0(1.5)         | 0.06 | 6.2(1.0)         | 6.5(1.2)         | 0.1 |
| General satisfaction          | 12.8(2.5)        | 13.2(1.9)        | 0.09 | 12.2(2.0)        | 12.0(2.4)        | 0.3 |
| Interpersonal- explanation given | 20(3.3)         | 20.5(2.9)        | 0.01 | 18.9(3.5)        | 18.8(3.5)        | 0.9 |
| Interpersonal- “considerateness” | 25.9(3.9)     | 26.6(3.6)        | 0.03 | 22.9(3.9)        | 22.4(3.8)        | 0.3 |
| Technical competent staff     | 13.1(1.9)        | 13.2(1.9)        | 0.8 | 14.6(2.2)        | 13.8(2.4)        | 0.01 |
| **(b) Perceived access to medical care** | | | | | |
| Availability                  | 33.3(8.1)        | 34.9(7.1)        | 0.03 | 28.7(7.3)        | 28.0(7.9)        | 0.1 |
| Acceptability and regularity of services | 44.7(10.8) | 47.4(10.2) | 0.03 | 45.7(10.4) | 46.5(9.5) | 0.6 |
| Concern for clients           | 3.7(3.1)         | 4.3(3.0)         | 0.001 | 5.1(1.6)         | 5.5(1.6)         | 0.02 |
| Affordability                 | 5.8(3.0)         | 6.7(3.5)         | 0.002 | 6.4(3.1)         | 7.3(3.6)         | <0.001 |

SD=Standard Deviation
Table 4: Distribution of reinforcing variables among self-medicated and prescribed medicine users

<table>
<thead>
<tr>
<th>Reinforcing variables</th>
<th>Allopathic medicine users</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Urban district</td>
<td>Self</td>
<td>Prescribed</td>
<td>p</td>
<td>Self</td>
<td>Prescribed</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Perceived overall health status</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Good</td>
<td>80(40.0%)</td>
<td>120(60.0%)</td>
<td>0.2</td>
<td>47(27.8%)</td>
<td>122(72.2%)</td>
<td>0.5</td>
</tr>
<tr>
<td>Bad</td>
<td>21(34.4%)</td>
<td>40(65.6%)</td>
<td>17(21.8%)</td>
<td>61(78.2%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannot assess</td>
<td>04(19.0%)</td>
<td>17(81.0%)</td>
<td>03(20.0%)</td>
<td>12(88.0%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presence of chronic disease</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>37(32.5%)</td>
<td>77(67.5%)</td>
<td>0.2</td>
<td>19(22.1%)</td>
<td>67(77.9%)</td>
<td>0.4</td>
</tr>
<tr>
<td>No</td>
<td>68(40.5%)</td>
<td>100(58.5%)</td>
<td>48(27.3%)</td>
<td>128(72.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of symptoms experienced</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>8(53.3%)</td>
<td>7(46.7%)</td>
<td>0.0001</td>
<td>4(44.4%)</td>
<td>5(55.6%)</td>
<td>0.0001</td>
</tr>
<tr>
<td>1</td>
<td>78(54.9%)</td>
<td>64(45.1%)</td>
<td>47(43.5%)</td>
<td>61(56.5%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2-3</td>
<td>8(21.6%)</td>
<td>29(78.4%)</td>
<td>16(16.3%)</td>
<td>82(83.7%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;3</td>
<td>11(12.5%)</td>
<td>77(87.5%)</td>
<td>0</td>
<td>47(100%)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Logistic regression analysis is summarized in Table 5. Respondents from urban households having ≤2 members were more likely to self-medicate than those from larger households (OR: 4.33, 95% CI: 1.10-17.53). Having negative attitudes towards non-formal sources of medicines decreased the likelihood of self-medication (OR: 0.26, 95% CI: 0.08-0.84). Of all the enabling variables, higher satisfaction with acceptability of medical services including the regularity of service decreased the likelihood of self-medication (OR: 0.96, 95% CI: 0.93-0.99) in the urban sector. Out of the reinforcing variables, only ‘having a symptom count of more than two’ reduced self-medication. In the rural sector, respondents highly satisfied with affordability of medical services (OR: 0.25, 95% CI: 0.08-0.80) and concern of the staff for clients (OR: 0.71, 95% CI: 0.52-0.94,) were less likely to self-medicate than those who were less satisfied with these aspects. However, higher satisfaction with technical competence of the pharmacy staff increased the likelihood of self-medication (OR: 1.53, 95% CI: 1.16-2.0). As in the urban sector, having a symptom count more than two decreased the likelihood of self-medication in comparison to those who had lesser counts in the rural sector also.

Discussion

Our study revealed that prevalence of self-medication with allopathic drugs significantly differed in an urban (12.2%) and rural population (7.9%) in Sri Lanka though both types of districts had very similar prevalence of overall medication use (urban 33.9%, rural 35.3%). Interestingly, our estimates are lower than the figures reported from other countries. This substantiates the fact that there is wide variation in self-medication prevalence. The variation between and within countries is due to the use of different definitions of self-medication, difference in health seeking behaviour of people, socio-cultural factors, relative prevalence and the seasonal variation of illnesses.15,19
Table 5: Adjusted odds ratios of factors associated with self-medication with allopathic drugs

<table>
<thead>
<tr>
<th>Variable</th>
<th>Adjusted Odds Ratio (95% Confidence Interval)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>(a) Urban district</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Household members</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;2</td>
<td>4.33(1.10-17.53)</td>
<td>0.04</td>
</tr>
<tr>
<td>Attitudes to drug availability at informal place</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative</td>
<td>0.26(0.08-0.84)</td>
<td>0.02</td>
</tr>
<tr>
<td>Number of symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;2</td>
<td>0.31(0.19-0.49)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Acceptability and regularity of service</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ mean satisfaction score</td>
<td>0.96(0.93-0.99)</td>
<td>0.02</td>
</tr>
<tr>
<td><strong>(b) Rural district</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of symptoms</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt;2</td>
<td>0.28(0.15-0.51)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Concern for clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ mean satisfaction score</td>
<td>0.71(0.52-0.94)</td>
<td>0.02</td>
</tr>
<tr>
<td>Affordability of medical care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ mean satisfaction score</td>
<td>0.25(0.08-0.80)</td>
<td>0.02</td>
</tr>
<tr>
<td>Technical competence of the pharmacy staff</td>
<td></td>
<td></td>
</tr>
<tr>
<td>≥ mean satisfaction score</td>
<td>1.53(1.16-2.0)</td>
<td>0.002</td>
</tr>
</tbody>
</table>

The prevalence of self-medication in developing countries is reported to be in the range of 12.7% to 95%.6,7 In Europe, estimates have been as high as 68%.28 Britain has reported prevalence estimates from 60% to 70%.19 In an urban community in Portugal, self-medication prevalence was 26.2% in urban and 21.5% in rural sectors.29,30 A study similar to our study in Spain reported a self-medication prevalence of 12.7% among adults with a recall period of two-weeks.7 A prevalence ranging from 9.7% to 39.9% in a two-day recall period has been reported in 12 cities in America and Europe.19 In Hong Kong prevalence of self-medication was 32.5%19 while in Jordan in the Middle East, it was 42.5%.21

Self-medication is a widely practiced phenomenon in the South-East Asia Region also.5 Our estimates of self-medication are lower than estimates reported in South Asia. Similar to our finding, India too has reported an urban (37%) rural (17%) differential in self-medication.32 Nepal,8 Pakistan11 and Punjab in India33 have reported prevalence estimates of around 50%. However, it has to be borne in mind that in Nepal, the prevalence was estimated over a six month recall period8 while in Punjab, it was life-time prevalence.33 A low rate of prevalence is expected when the recall period is two weeks.34

Our study confirmed the anticipated low prevalence of self-medication in the rural sector. So far only proxy indicators like relatively low self-medication prevalence for...
malaria medicine in Moneragala district had indicated low self-medication practice in a rural area. \(^1\) Though our population-based prevalence estimates are relatively low for both sectors, self-medication prevalence may be high in specific groups such as children (85%) of urban mothers. \(^1\) Similarly, another study using the same definition of self-medication and the same recall period used by us has reported that 49.6% of those who reported an episode of illness in an urban area in the Western Province had self-medicated. \(^3\)

Access to medical care and satisfaction with pharmacy services emerged as important predictors of self-medication. In many settings, patient’s satisfaction with the health care provider has been identified as an important factor affecting self-medication. \(^10,13,33,36\) In the context of Sri Lanka, we found that despite the availability of a well-developed public-private health care network in the urban sector, when clients perceive available medical services to be irregular and unacceptable, they tend to resort to self-medication.

A majority of the respondents in our study self-medicated with one drug (urban 49%, rural 73%), for conditions that were perceived as mild and self-limiting (urban 55%, rural 64%). This was confirmed in the multivariate analysis where lower number of symptom count as a proxy measure of less severity of illness emerged as a strong predictor of self-medication. Thus, it is no wonder that due to perceived poor satisfaction with medical care, self-medication becomes a low cost alternative (no consultation fees, and direct/indirect opportunity costs) particularly for mild illnesses among people with a busy urban lifestyle.

In contrast to the urban sector, perceived affordability of medical care decreased the likelihood of self-medication in the rural sector. It indicates that people in the economically weak rural area are more likely to consult a medical practitioner for a medical condition, than unnecessarily spending money on self-medication. This behaviour seems to be a way of rationally and efficiently spending hard-earned money on health in low-and middle-income areas. A similar behaviour has been demonstrated in a middle-income area of Brazil. \(^3\)

The fact that perceived technical competence of the pharmacy staff emerged as a predictor of self-medication in the rural sector leads to two implications. First, it reflects the central role a pharmacy plays as an alternative source of medical care in rural areas. Secondly, it indicates the extent to which clients in areas with scarce health services confide in the competency of the pharmacy staff as service providers for selected conditions. The symptom count acts as a proxy measure of the perceived severity of the illness for consumers to make a decision regarding physician consultation. Relying on staff of retail drug stores is a common phenomenon in the Region. In Nepal, drug retail shops frequently serve as the first point of contact with the health services. \(^8\) In India, pharmacists and pharmacy attendants fulfill this role. \(^8,14,15\) This fact is useful for policy makers as it enables designing policies and strategies on capacity building of pharmacy staff with a view to providing a better service to clients in rural areas.

This study has some limitations. Had a follow-up component been included it would have allowed an objective assessment of the disease conditions for which medicines were used. Use of a diary to collect information would have minimized the deficiencies of recall method. In this study, measures of access to medical care and satisfaction with
pharmacy services were assessed in a general context. Relating their recent experiences to specific aspects of pharmacy care and specific pharmacies would have increased the validity of the data. More importantly, generalization of our study findings to other areas of the country may be limited since self-medication is a self-initiated behaviour which tends to vary from setting to setting.19

In conclusion, it must be stated that self-medication, at comparatively low rates, exists in Sri Lanka with an urban-rural differential. Self-medication phenomenon should not be looked at negatively. The positive aspects of self-medication related to PHC should be recognized. However, policy makers and planners need to revisit policy and regulatory aspects to ensure restricting access to prescription-only drugs to minimize the negative impact of self-medication. To enable people to practice appropriate, safe and effective self-medication and obtain the maximum benefits, public information, communication and education packages should be developed. Pharmacy staff and dispenser capacity building programmes are other important activities in this regard. Given the finding that their perceived competence is a predictor of self-medication in rural areas, district health planners need to pay special attention to the strategy of empowering pharmacy staff as alternative prescribers for limited conditions/drugs.

Some measures of access to medical care play an important role in initiating self-medication behaviour.1,6,33,35 Hence, measures to improve acceptability of services by clients, ensuring regular services and improving the focus on concerns for the client’s integrity by the staff are noteworthy considerations for reducing irrational and inappropriate medicines use. The national project for the improvement of quality and safety of healthcare institutions37 is an appropriate stepping stone to achieve this objective.

References


Effect of patient education and standard treatment guidelines on asthma control: an intervention trial

Anita Kotwani\textsuperscript{a}, Sunil K Chhabra\textsuperscript{b}

**Background:** Denial of having a chronic condition, poor knowledge of the disease process and lack of adherence to standard treatment are often considered to be important factors that increase morbidity in asthma. We evaluated the effect of standard treatment guidelines and asthma education programme on asthma control among patients enrolled from a referral health facility of Delhi in India.

**Methods:** Fifty patients who visited the health facility first time for treatment of asthma were enrolled after confirming the diagnosis of asthma by symptoms and reversible spirometry. Patients were interviewed at baseline using three researcher-administered questionnaires - quality of asthma management questionnaire, asthma control questionnaire (ACQ) and asthma knowledge questionnaire (AKQ). All patients were given pharmacotherapy according to standard treatment guidelines. In addition, every alternate patient was also given a face-to-face educational intervention. Patients were followed up at 2, 4, 8 and 12 weeks. The ACQ was used at each visit, and AKQ was reassessed at the twelfth week. The paired t test was used to detect significant changes in various domains of asthma control.

**Results:** The knowledge of asthma among patients and the care provided by previous health-care providers were found to be poor at baseline assessment. The application of standard treatment guidelines improved asthma control by the second week and the changes became significant by the fourth week, which persisted till the twelfth week (\(p <0.0001\)). Educational intervention led to improvements in knowledge in several domains. Improvements in asthma symptoms began earlier among those who had additional educational intervention.

**Conclusions:** Standard treatment guidelines and asthma education improved asthma control.

**Key words:** Asthma, knowledge, intervention trial, patient education, quality of care.

**Introduction**

Asthma is an important public health problem worldwide on account of its prevalence, its under-recognition, inadequate pharmacotherapy and self-management by patients. There is evidence to suggest that denial of having a chronic condition,\textsuperscript{1} poor knowledge of the disease process,\textsuperscript{2} medication use,\textsuperscript{3} and poor self-management are frequent reasons for increased morbidity in asthma.\textsuperscript{4} These issues are particularly relevant in respect of primary care, through which most asthma cases
are managed. Moreover, the issue of not managing asthma in the community according to well established standard treatment guidelines (STG) with inhalation therapy and self-management programme in developing countries is more worrisome.

The earlier studies conducted in India revealed nonavailability of essential asthma medicines in the public sector of many states, unaffordable inhalation medicines in the private sector for majority of the population, suboptimal knowledge of primary care physicians, and poor asthma management at primary care level. Asthma education is considered an essential component of asthma management. It is necessary to help patients gain the motivation, skills and confidence to control their asthma. The cost of treatment of uncontrolled asthma and severe asthma is huge. Interventions are needed for optimum management of asthma, especially in low-income countries and underprivileged families. Hence, there was a pressing need for conducting an intervention study to provide evidence for the impact of standard treatment guidelines and patient education on the treatment outcome in asthmatic patients. We have conducted a controlled trial of standard treatment guidelines and asthma education programme among adults with asthma.

**Methods**

**Study design and settings**

This interventional study was conducted during the period from March 2006 to December 2006 at the Out-Patient Department (OPD) of the V. P. Chest Institute, Delhi, a tertiary care referral public hospital in India. The study was approved by the Institutional Ethics Committee. Informed consent was obtained from patients.

**Study population**

Patients aged 18 years and older who presented to the chest clinic for the first time with history suggestive of asthma were included. Patients were enrolled on two OPD days per week from the clinic of one of the investigators. After clinical evaluation, the diagnosis of bronchial asthma was confirmed, based on symptoms and reversible spirometry, as per the Global Initiative for Asthma (GINA) guidelines. Patients with an acute exacerbation of asthma and those with another concurrent respiratory disease or any systemic disease were excluded. A total of 50 patients were enrolled for the study. The sample size for each intervention group was calculated to have 80% power of detecting a significant difference in the mean score of two groups – one who used inhalers and the other who did not use inhaler.

**Baseline data on quality of treatment**

After confirmation of asthma, information data on quality of treatment received by patients previously was collected by a questionnaire based on the GINA guidelines for asthma management. It contained questions in four domains – information about the health care provider; diagnosis and assessment of severity; treatment; and patient education. Subject responses were structured (multiple-choice or yes/no). None of the enrolled patients had attended any type of asthma education programme.

**Intervention**

All patients were treated by a chest physician (SKC) according to standard treatment guidelines (STG) prescribed by The Global Initiative for Asthma (GINA) and inhalation therapy was prescribed to all of them. The correct technique of inhalation was
demonstrated to all patients by a staff attached to the physician in the outpatient department as part of the standard treatment guideline followed in the hospital.

Out of the above-mentioned intervention group, who were given therapy according to STG, alternate patients were allocated to an additional intervention, i.e. one session of face-to-face asthma education programme. Educational sessions were conducted by one of the authors (AK) with each patient individually. The sessions were designed to be interactive and personalized. They were based on the treatment and self-management guidelines suggested by GINA. The sessions included: (i) a 20-minute interactive lecture with visual aids outlining the physiology of airway narrowing in asthma and trigger factors; (ii) a 20-minute discussion on medications, their action and side-effects, emphasizing the advantages of inhaled corticosteroids for treatment of asthma; (iii) display of peak flow metre, spacer, meter-dose inhaler and rota inhaler; (iv) interaction with patients to address any of their questions, concerns, fears and beliefs. However, educational messages were not reinforced at any of the follow-up visits.

Questionnaires

The following two questionnaires were administered to all patients at the baseline (week 0):

The Asthma Control Questionnaire (ACQ) is a standardized, widely available and validated instrument with strong evaluative and discriminative properties to measure asthma control in patients. The questionnaire in local language (Hindi version) was used. The ACQ has a total of seven questions that include the six highest scoring symptoms with one question about daily rescue therapy use (β2 agonist) and FEV1 % predicted normal. Patients are asked to recall how their asthma has been during the previous week and how did they respond to the symptom and bronchodilator use. The responses were on a 7-point scale (0=no impairment, 6= maximum impairment). The ACQ is able to identify the adequacy of asthma control in individual patients. In general, patients with a score below 1.0 will have adequately controlled asthma and above 1.0 will not have well controlled asthma. However, there is a grey area between 0.75 and 1.25 where patients are on the borderline of adequate control.

The five symptom-scoring questions asked are: average number of times a patient is woken up by asthma during the night; asthma symptoms at the time of waking up; limitation in performing activities; shortness of breath, and wheezing, and the sixth question is about how many puffs of short-acting bronchodilator (rescue therapy) were taken during the previous week.

The Asthma knowledge questionnaire was developed in both English and Hindi (local language) to obtain information about different aspects of the disease that a patient is expected to have for making him/her an active partner in self-management. The Hindi version of the questionnaire was used in this study. It contains 28 questions, divided into the following six domains – etiology (3 questions); patho-physiology (3 questions); symptoms and assessment of severity (8 questions); medication (8 questions); prevention (4 questions); and natural history (2 questions). Responses were scored on a categorical scale where 0 represented ‘no knowledge/no response’ and 1 represented adequate knowledge.

The asthma knowledge questionnaire was developed on the basis of the GINA guidelines. There is no “gold standard” for knowledge and therefore only content validity is relevant. The
content of knowledge a patient is expected to have served as the basis for development of the questionnaire. Repeatability was tested by re-administration on another occasion and by comparing the two sets of responses.

Follow-up
Patients were instructed to come for follow-up visits at week 2, 4, 8 and 12. The asthma control questionnaire and pulmonary function tests were administered at each follow-up visit whereas re-testing of asthma knowledge (AKQ) was performed after three months (twelfth week). Subjects were not told initially that they would be administered asthma knowledge questionnaire at their twelfth week visit. The data collector was not provided with the subject’s pre-intervention asthma knowledge results.

Of the 50 subjects who met the inclusion criteria, 12 patients had an irregular follow-up. They were excluded from the study at the time of analysis. Out of the 12 dropped-out patients, 7 never came for any follow-up visit, 4 patients dropped out at 4 weeks and one patient dropped out at 8 weeks.

Analysis
The outcome measure included change in the domains of asthma knowledge and asthma control (from baseline to twelfth week follow-up visit). Data were entered using MS Office Excel and all statistical analyses were carried out using the Statistical Package for Social Sciences (SPSS) 12. The change (from baseline to twelfth-week assessment) in asthma control and asthma knowledge was evaluated by using the paired t test. The difference between the two groups was assessed by using student’s t test for independent samples.

Results
Out of the 38 patients who had completed follow-up, 20 were men and 18 women. Of these patients, 18 had mild, 13 had moderate and 7 had severe persistent asthma.

Quality of treatment at baseline
As shown in Table 1, the majority (74%) patients had consulted more than one doctor before visiting the referral chest clinic and 61% had no idea about their doctor’s qualification. Only 25 (66%) patients were informed by their doctors that they were suffering from asthma; of these, only 10 (26%) were told about the severity of their disease. The lung function test and peak flow measurement were performed in only few (10%) patients.

Only 42% patients were prescribed inhaling therapy. Of these 16 patients, who were prescribed inhaling therapy, 56% (9 patients) and 50% (8 patients) respectively, were not told about the type of medicine in the inhalers and the purpose of inhalation. Up to 30% patients revealed that they had learnt about the use of inhalers from the package insert, other patients or clinical staff other than their doctor.

None of the subjects were provided with any educational material about the disease process. Only 24% recalled having been given information regarding the early signs of worsening of asthma. Very few (10%) were given verbal instructions to manage asthma in the event of a worsening condition. Only one patient had any objective means of assessing his asthma as he was advised to use a peak flow metre at home. Up to 58% patients revealed that they were not given any instructions regarding the preventive measures to lessen the symptoms of asthma.
At baseline, the quality of treatment was similar in the two groups (STG vs STG + additional education). All four patients who were aware of peak flow metre were in the STG group.

**Effects of intervention**

Two interventions were carried out in the study: (i) all patients were treated according to standard treatment (GINA) guidelines, and (ii) in addition, basic education was imparted to half the patients. The effect of education was studied on asthma control and asthma knowledge till the twelfth week follow-up.

**Asthma knowledge**

Table 2 shows the effect of interventions on various domains of asthma knowledge after 12 weeks of follow-up. Significant improvement in knowledge occurred in most knowledge domains. The domains that showed improvement in both intervention groups were patho-physiology, symptoms and severity of asthma, and prevention. However, patients who were given face-to-face educational intervention also showed improvement in medication. The improvement in the knowledge of patho-physiology was statistically greater in the educational group.
Asthma control

All the five symptoms of asthma control started improving from the second week onwards but significant effect was observed at the fourth week, which continued till the end of the study period (Table 3).

Among patients who were given one session of basic education in addition to the treatment as per STG, the symptoms of asthma control started improving earlier than their counterparts who received only STG intervention. Patients with additional educational intervention showed improvement in “shortness of breath” from the second week onwards whereas the other group (only STG) showed improvement from the fourth week onwards. Patients with additional educational intervention also showed improvement in limitation of activity from the fourth week whereas the other group (only STG) showed improvement from the eighth week onwards.

One of the seven questions in the asthma control questionnaire (ACQ) is the use of rescue therapy. At baseline, only 42% (16) patients were prescribed any inhalers and only a few were actually aware that they were taking any \( \beta_2 \)-agonists. Throughout the study period the average score for rescue therapy remained less than one, i.e. adequate asthma control in all patients. The FEV\(_1\) % predicted value did not change significantly in both groups during the study period.

**Discussion**

We have assessed the effectiveness of standard treatment guidelines on referred asthma patients from the community to a chest hospital in outpatient settings. The baseline assessment showed that asthma management was not done optimally by health-care providers. Our study shows that standard treatment guidelines can improve the asthma symptoms. Controlled studies also report that inhalation therapy and standard therapeutic guidelines can improve the asthma symptoms.\(^{19}\) All the five symptoms, i.e. average wakefulness in night due to asthma, morning wakefulness due to asthma, limitation

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**Table 2: Effect of standard treatment guidelines and one face-to-face education session on knowledge about asthma**

<table>
<thead>
<tr>
<th>Knowledge domains</th>
<th>Standard treatment guidelines group Mean score (1 Standard Deviation)</th>
<th>Standard Treatment guidelines + Education session Mean score (1 Standard Deviation)</th>
<th>( p )</th>
<th>( p )</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 week</td>
<td>12th week</td>
<td>0 week</td>
<td>12th week</td>
</tr>
<tr>
<td>Etiology</td>
<td>0.55(0.19)</td>
<td>0.64(0.18)</td>
<td>0.2</td>
<td>0.49(0.21)</td>
</tr>
<tr>
<td>Patho-physiology</td>
<td>0.61(0.32)</td>
<td>0.79(0.25)</td>
<td>0.004*</td>
<td>0.42(0.37)</td>
</tr>
<tr>
<td>Symptoms and severity assessment</td>
<td>0.72(0.15)</td>
<td>0.81(0.15)</td>
<td>0.015*</td>
<td>0.74(0.16)</td>
</tr>
<tr>
<td>Medications</td>
<td>0.51(0.19)</td>
<td>0.61(0.17)</td>
<td>0.095</td>
<td>0.63(0.23)</td>
</tr>
<tr>
<td>Prevention</td>
<td>0.66(0.29)</td>
<td>0.82(0.23)</td>
<td>0.001*</td>
<td>0.64(0.24)</td>
</tr>
<tr>
<td>Natural history</td>
<td>0.76(0.31)</td>
<td>0.76(0.35)</td>
<td>1.0</td>
<td>0.76(0.31)</td>
</tr>
</tbody>
</table>

\* \( p \) values for change from baseline (0 week) to 12th week (paired t-test).

\# \( p \ <0.05 \) for difference between the two intervention groups (t-test for independent samples).
Effect of standard treatment and education on asthma control

Anita Kotwani et al.

Table 3: Effect of standard treatment guidelines (STG) and patient education session on asthma control

<table>
<thead>
<tr>
<th>Asthma Symptoms</th>
<th>Symptom score in the follow-up period: Mean (1 standard deviation)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0 week</td>
</tr>
<tr>
<td>(A) STG group (n=19)</td>
<td></td>
</tr>
<tr>
<td>Wakefulness at night</td>
<td>1.84(0.36)</td>
</tr>
<tr>
<td>Morning symptoms</td>
<td>2.53(0.51)</td>
</tr>
<tr>
<td>Limitation in activities</td>
<td>2.11(0.51)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>2.37(0.38)</td>
</tr>
<tr>
<td>Wheezing</td>
<td>1.95(0.47)</td>
</tr>
<tr>
<td>Need for rescue therapy</td>
<td>0.84(0.32)</td>
</tr>
<tr>
<td>FEV₁ %</td>
<td>3.21(0.46)</td>
</tr>
<tr>
<td>(B) STG + Education group (n=19)</td>
<td></td>
</tr>
<tr>
<td>Wakefulness at night</td>
<td>2.26(0.37)</td>
</tr>
<tr>
<td>Morning symptoms</td>
<td>2.68(0.46)</td>
</tr>
<tr>
<td>Limitation in activities</td>
<td>2.79(0.46)</td>
</tr>
<tr>
<td>Shortness of breath</td>
<td>3.58(0.37)</td>
</tr>
<tr>
<td>Wheezing</td>
<td>2.79(0.44)</td>
</tr>
<tr>
<td>Need for rescue therapy</td>
<td>0.68(0.20)</td>
</tr>
<tr>
<td>FEV₁ %</td>
<td>2.37(0.47)</td>
</tr>
</tbody>
</table>

* p-value <0.05 for change from baseline (0 week) to 2nd, 4th, 8th and 12th week (paired t test),
# p <0.05 for difference between the two intervention groups (t-test for independent samples)
STG = Standard treatment guidelines

In doing activities, shortness of breath, and wheezing improved and their asthma was under control.\textsuperscript{16,17} The average score for need of rescue therapy was less than one at all follow-up visits, which again indicates that asthma was under control.\textsuperscript{17} We could not find improvement in FEV₁ value at follow-up visits. One of the reasons is that lung functions take a longer time to improve. The other important reason could be that many patients may not have adhered to their prescribed medications. We did not study the adherence of patients to therapy as that was not the aim of the study. Patients were either discontinuing the therapy or decreasing the doses when there were no symptoms or when symptoms were less troublesome. This fact was disclosed by many patients when they were probed during the follow-up visit with regard to deterioration of symptoms as compared with the previous
visit. There are reports from other parts of the world indicating the widespread nature of acute episodic disease belief for asthma.\textsuperscript{20,21} The sudden onset of asthma symptoms during an acute attack with symptom-free period in between encourages patients to believe that their disease is of acute nature without any long-term impact. Absence of symptom or improvement in breathing is the major cause for intentional interruption in inhalation of medicines in asthma.\textsuperscript{22} Non-adherence to inhalation of therapy is a very well-recognized phenomenon in asthma treatment.\textsuperscript{23} Therefore, asthma education and self-management by patient is the important component of rational treatment of asthma.\textsuperscript{4, 9, 13, 24}

We assessed the effectiveness of additional asthma educational intervention among half the patients. Though we had given a brief session of basic education it showed improvement in knowledge of asthma medication. Also, the improvement in knowledge about the pathophysiology of asthma was better. The study was able to reproduce what had previously been reported by controlled studies that an educational programme can increase a patient’s knowledge of asthma.\textsuperscript{11, 25,26} The knowledge scores were generally poor in our patients at the initial assessment so we could get an improvement in the scores even after one session of education. The group that was not given additional education also showed improvement in knowledge in three domains though the improvement was less than the intervention group. A similar finding was observed by other researchers — waiting in the hospital and periodic filling of questionnaires can improve asthma knowledge.\textsuperscript{27, 28} Several factors could have contributed to improvement in knowledge of asthma in the group that did not receive face-to-face education session. The knowledge at baseline was very poor. None of the patients had undergone lung function test before visiting the study hospital. All patients were exposed to some education as part of their routine medical treatment in the chest hospital under the care of a respiratory physician. Moreover, all patients were instructed about how to use inhalers by staff associated with the respiratory physician in the OPD. Finally, they were asked about the asthma knowledge questionnaire at the beginning of the study. Later, at each follow-up visit patients were seen interacting with the research team for filling up of the asthma control questionnaire. These factors could have contributed to improvements in asthma knowledge in the group that was not covered by face-to-face education.

It seems that the face-to-face asthma education session increased the adherence to asthma treatment in the initial period. That is why symptoms of asthma control showed improvement earlier in patients who were given educational intervention, as compared with the other group. May be one educational session had only a brief impact that did not last long enough for any significant improvement to be observed between the two groups at the eighth and the twelfth week. This shows that reinforcement of education is important for sustained effect. An earlier study conducted in Turkey\textsuperscript{25} on asthma education has shown that significant improvement in asthma knowledge was observed after two months, but that it declined after one year. A study conducted with parents for childhood fever has shown that reinforcement education (second education) with written and pictorial material significantly improves knowledge about fever management in children.\textsuperscript{29} These studies clearly suggest that reinforcement of educational intervention is required for long-term effect. For treatment of asthma, reinforcement of education is more important because as mentioned above non-adherence to treatment because of patient’s beliefs is a
big challenge. It is reported that although, patient’s beliefs govern their attitudes towards therapy, these beliefs are not fixed and can be changed through education and negotiation. Therefore, educational intervention should be reinforced with written action plan and material in order to get sustained and optimum results.

This study had some inherent limitations, e.g. it was undertaken at one referral tertiary care-level public hospital. Thus, it may not be representative of the general practice. Moreover, patients who visited the study hospital had already visited other doctors. Hence, they were probably more motivated to control their disease. Also, the sample size of the study was small. As the baseline level, asthma control and asthma knowledge was poor, therefore, a small sample size could show significant effect of interventions on asthma knowledge and control; yet caution should be taken in generalizing the findings. Nevertheless, the findings are encouraging; therefore a larger study involving more primary-care facilities should be conducted to show the effect of standard treatment guidelines and patient education on asthma control.

To conclude, asthma management is not optimum and majority of patients are not treated with essential asthma medicines. Also, they are not imparted any asthma education. Pharmacotherapy according to standard treatment guidelines at the chest clinic significantly improved asthma symptoms. A brief educational intervention improved the understanding of patients in some important domains such as medications. Asthma education led to improvement in asthma symptoms earlier, as compared with the group that did not receive face-to-face educational intervention. It also seems that educational intervention led to better adherence to medication for a brief period of time. Reinforcement of educational intervention with written self-management programme may be required for continuous and sustained asthma control.

Acknowledgements
We wish to acknowledge the contributions of Mr Bishnu Das who helped in data collection and data entry, and Dr Vandana Tayal and Ms Barnali who helped in the analysis of data. The study was funded by the Health Action International (Asia-Pacific), Colombo, Sri Lanka.

References


The pattern of psychiatric admissions in a referral hospital, Bhutan

Rinchen Pelzang

**Background:** Mental illnesses are becoming a public health issue in all countries. However, data in most of the developing countries including Bhutan are scarce. This study aimed to explore the trends of admissions in the psychiatric ward of a referral hospital in Thimphu city of Bhutan.

**Method:** The study employed a retrospective analysis method. The data were obtained from the patient admission register of the psychiatric ward to capture distribution by age, gender, occupation, nationality, clinical diagnosis, and length of stay in the ward. International Classification of Diseases (ICD) 10th Revision was used for classification of the diseases. Descriptive statistics were used to describe the pattern of patient admissions. Demographic characteristics of the sample were cross-tabulated with clinical diagnosis and chi-square test was used to test statistical significance.

**Results:** In the psychiatric ward 1336 patients were admitted over a seven-year period. In 2004-05, 127 patients were admitted, which increased to 376 in 2010-11. Higher numbers of males (64.1%, 856) were admitted than females (35.9%, 480). Mental and behavioural disorders due to psychoactive substance use were the most common (45.5%) reason for admission. Among the admitted patients, 18.8% had no job or were dependents. A large number of patients were from Thimphu District (10.8%) and 42% of the patients stayed for one to two weeks in the hospital.

**Conclusions:** Psychiatric admissions were found to be increasing every year. Alcohol and drug use disorders were the most frequent diagnosis leading to hospitalization. Attention must be paid to increasing the in-patient services for psychiatric patients.

**Key words:** Bhutan, mental disorders, psychiatric admissions, morbidity.

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**Introduction**

Mental illnesses are becoming a public health issue in all countries around the world. The number of people with mental illness requiring care in general settings is increasing every year. Besides, there has been a tendency to neglect the care of mentally ill in general settings due to lack of knowledge on mental illness and its management among health professionals. Issues are further compounded by the lack of adequate epidemiological information on mental illnesses around the globe including...
Bhutan. Reliable and valid epidemiological information on various mental disorders are necessary in order to improve mental health care services for the mentally ill.

Bhutan is a small Kingdom with an area of 38,394 square kilometres and a population of 672,425. With the realization of emerging mental health problems, the Government of Bhutan launched the Mental Health Programme in July 1997 coinciding with the 8th Five Year Plan. The main objective of the Mental Health Programme is to integrate mental health care services with general health care services to provide community-based mental health care services to people. Mental health care in Bhutan is delivered through 63 community-based psychiatric inpatient units. Psychiatric patients admitted to these community-based psychiatric units had mood disorders (32%), mental and behaviour disorders due to psychoactive substance use including alcohol (27%), and schizophrenia (19%).

In order to treat the severely ill referred cases from the districts, an eight-bed psychiatric ward was opened in Jigme Dorji Wangchuk National Referral Hospital (JDWNRH) at Thimphu on 29 March 2004. The bed capacity of the ward was increased to 18 in 2010. While several patients with mental illness were admitted in the psychiatric ward, the pattern of mental illnesses admitted has not been systematically studied. Therefore, a study was conducted to describe the type of psychiatric diagnosis among the admitted patients in the psychiatric ward of JDWNRH and to determine the relationship of psychiatric disorders with socio-demographic characteristics of the patients.

Methods
This retrospective study was carried out in the 18-bed psychiatric ward of JDWNRH in Thimphu, the capital of Bhutan. It is the only psychiatric ward with psychiatrists in the entire country which serves as a treatment centre for all kinds of mental disorders (including substance use disorders). Data were obtained from the indoor register of the psychiatric ward from 29 March 2004 to 28 March 2011. Data captured includes age, gender, occupation, nationality, clinical diagnosis, duration of stay in the ward and admissions per year. Patients were diagnosed by national psychiatrists according to the International Classification of Diseases (ICD) 10th Revision diagnostic criteria. All patients admitted in the ward were included. There were no patient age restrictions for admissions. Re-admissions were also included in the data set. Therefore, the data analyses presented here are based on the total number of admission episodes rather than the number of individuals admitted.

Statistical analysis
Data was managed and analysed using the Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistics were used to describe the pattern of patient admission. Mean and standard deviation of patient age were examined. Cross-tabulation was performed for comparison of the demographic characteristics of the sample and clinical diagnosis. Chi-square tests were used for statistical tests. The data were presented as frequency and percentage.

Results
Socio-demographic characteristics of patients
There were 1336 admissions in the psychiatry ward of JDWNRH over a seven-year period. The highest number of patients admitted in any year was 376 in the seventh year (Table 1). The age range of the patients was 10 to 82 years, with a mean of 32.7 and standard deviation of 11.8 years. Overall, a higher
Prior number of males were admitted (64.1%, 856) than females (35.9%, 480). Patients with no job or dependents accounted for 18.8% (251), followed by 17.9% (239) who were employed in Government services. Monks or nuns accounted for 5.1% (68) of the patients. Most (98.5%) of the patients admitted were nationals (Table 2). The highest number of patients admitted were from Thimphu (144, 10.8%), followed by Paro (138, 10.3%) and Samtse district (137, 10.3%). There were very few patients (20, 1.5%) from other countries.

Most of the admitted patients stayed in the ward for one to two weeks (561, 42%) followed by less than one week (337, 25.2%). Only 13 (1%) stayed for more than two months.

**Clinical Classification**

Figure 1 shows the number of admissions categorized by clinical diagnosis. The most common psychiatric diagnosis was alcohol use disorders (33.5%), followed by bipolar [affective] disorders (BPAD) (15.3%). Depression and psychosis accounted for 8.6% and 11.8% respectively. Figure 2 shows the number of admissions based on ICD-10 classifications. The majority of the admissions were mental and behavioral disorders due to psychoactive substance use (608, 45.5%) followed by BPAD (321, 24.0%).

**Association of socio-demographic characteristics with clinical diagnosis**

Cross-tabulation of clinical diagnosis with demographic characteristics revealed that the distribution of clinical conditions varied by the age ($p < 0.001$), gender ($p < 0.001$), and occupation ($p < 0.001$) of the patients.

**Table 1: Time trend of admissions to the psychiatry ward of Jigme Dorji Wangchuk National Referral Hospital at Thimphu, Bhutan**

<table>
<thead>
<tr>
<th>Years*</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>2004-05</td>
<td>127</td>
</tr>
<tr>
<td>2005-06</td>
<td>123</td>
</tr>
<tr>
<td>2006-07</td>
<td>143</td>
</tr>
<tr>
<td>2007-08</td>
<td>134</td>
</tr>
<tr>
<td>2008-09</td>
<td>194</td>
</tr>
<tr>
<td>2009-10</td>
<td>239</td>
</tr>
<tr>
<td>2010-11</td>
<td>376</td>
</tr>
</tbody>
</table>

* 29 March to 28 March of next calendar year
Figure 2: Distribution of patients by ICD-10 classification (n=1336)

Table 2: Distribution of patients by socio-demographic characteristics (n=1336)

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age group (years)</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10-19</td>
<td>148</td>
<td>11.1</td>
</tr>
<tr>
<td>20-29</td>
<td>461</td>
<td>34.5</td>
</tr>
<tr>
<td>30-39</td>
<td>382</td>
<td>28.6</td>
</tr>
<tr>
<td>40-49</td>
<td>238</td>
<td>17.7</td>
</tr>
<tr>
<td>50-59</td>
<td>72</td>
<td>5.4</td>
</tr>
<tr>
<td>60-69</td>
<td>19</td>
<td>1.4</td>
</tr>
<tr>
<td>70+</td>
<td>18</td>
<td>1.3</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>856</td>
<td>64.1</td>
</tr>
<tr>
<td>Female</td>
<td>480</td>
<td>35.9</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government employee</td>
<td>239</td>
<td>17.9</td>
</tr>
<tr>
<td>Private employee</td>
<td>198</td>
<td>14.8</td>
</tr>
<tr>
<td>Dependent/no job</td>
<td>251</td>
<td>18.8</td>
</tr>
<tr>
<td>Student</td>
<td>175</td>
<td>13.1</td>
</tr>
<tr>
<td>House wife</td>
<td>189</td>
<td>14.1</td>
</tr>
<tr>
<td>Farmer</td>
<td>216</td>
<td>16.2</td>
</tr>
<tr>
<td>Monk/Nun</td>
<td>68</td>
<td>5.1</td>
</tr>
<tr>
<td><strong>Nationality</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bhutan national</td>
<td>1316</td>
<td>98.5</td>
</tr>
<tr>
<td>Foreigners</td>
<td>20</td>
<td>1.5</td>
</tr>
</tbody>
</table>
In the age group of 30-39 years, people were admitted for alcohol use (175, 45.8%), depression (35, 9.2%) and somatoform disorder (13, 3.4%); in the age group of 20-29 years drug use (103, 22.3%), BPAD (74, 16.1%), psychosis (68, 14.8%), and anxiety disorder (21, 4.6%) were more common; in the age group of 10-19 years dissociative [conversion] disorders were more frequent.

Males were admitted for alcohol problem (375, 43.8%), drug use (129, 15.1%) and psychosis (10.0%) whereas females were found to be admitted for BPAD (123, 25.6%), depression (61, 12.7%), anxiety (35, 7.3%), dissociative [conversion] disorder (45, 4%) and somatoform disorder (19, 4%).

More government employees (129, 54.0%) had alcohol problem. Students (48, 27.4%) and people without a job or dependents had more drug use problems (48, 19.1%) than people with other occupations. Most of the BPAD, anxiety and somatoform patients were housewives (43, 22.8%); psychosis (39, 15.5%) and epilepsy (16, 6.1%) were more common in people with no job or among dependents; depression among farmers (29, 13.4%) and dissociative [conversion] disorders in students (34, 19.4%) were more frequent.

**Discussion**

This study explored the pattern of admissions in the psychiatric ward at JDWRH, Bhutan. There are several interesting findings from this study. There is an increase in admissions from 127 in the first year to 376 in the seventh year (Table 1). The patient admissions have almost tripled in the seventh year. Although changes in admission policies were not investigated, it seems the main reason for the increase in the number of inpatient was public awareness activities, and the mental health policy of educating primary health care staff on mental illness and its management. This also indicates that more mental health awareness campaigns need to be carried out through the media and other means to educate the public on mental illnesses to reduce stigma towards mental illnesses and encourage people to seek treatment.

More men than women were admitted to the psychiatric ward for treatment. This finding supports the study carried out to find the pattern of psychiatric illness admitted in psychiatric units in England\(^2\) and in Bangladesh.\(^3\)

The study revealed that a majority of the admissions were for mental and behavioural disorders due to psychoactive substance use. Patients in the age group of 30-39 years were most frequently admitted for alcohol use. These findings are consistent with other studies.\(^2,4,5\) It also revealed that most patients who were admitted for alcohol problem were government employees. Those who were admitted for drug use were found to be students and people without a job or dependents. The possible reason for more admissions of substance abuse in the ward could be peoples’ awareness on the availability of treatment and management for substance use disorders in the hospital.

Most of the patients admitted stayed for one to two weeks in the ward. The length of stay in this study is more or less similar to 15 days found by another study.\(^6\) Perhaps this finding is related to the hospital policy of not keeping the patients for more than two weeks.

A majority of the patients admitted were from Thimphu and the nearby district Paro. It may be due to the location of the psychiatric ward in Thimpu. However, the situation is not straight forward as there are an equal number of patients admitted from Samtse district which is quite far from the location of the psychiatric ward. Further, it is not clear from this study whether such differences in patient admissions represent local variations in psychiatric illnesses. Further research is needed to investigate the actual number of psychiatric illnesses in different districts.
More females were admitted to the psychiatric ward for BPAD. Females admitted with BPAD were found to be housewives. These findings, however, are very unique and are not consistent with other studies. Although we could not find explanations for these findings, coding-related problem during diagnosis may be there. Therefore, further research with accurate diagnostic coding is necessary for confirmation of these findings. The study revealed that more housewives were admitted for anxiety and somatoform disorders. These findings are consistent with other studies.4,7,8,9

Most admissions for psychosis and epilepsy were found in people with no job or those who are dependent. This could be due to presence of psychiatric disorders. Poor mental health can lead to job loss due to poor work performance.10

Patients admitted for depression were only 12.8% (171) of total admissions. This finding differs from other studies2,5,11 which state that depression is the most common diagnostic category admitted in a psychiatric ward. Those admitted for depression were mostly females and farmers. Though this finding from hospital cannot be generalized to the population, one can hypothesize an association of farmers and female with depression which needs confirmation.

Finally, patients admitted for dissociative [conversion] disorders were found to be students, mostly female within the age group of 10-19 years. This finding is consistent with another study.12

The findings of this study must be interpreted in the light of a number of limitations. First, this was a retrospective study involving only one psychiatric ward in a referral hospital. It would be unwise to generalize the findings to the rest of the country or to reach conclusions about the epidemiological relationships. Second, the data analyses presented in this study were based on the total number of admission episodes rather than the number of individuals admitted. We were unable to look at the number of re-admissions of each patient which could have made a difference to the number of cases admitted in the ward. Third, the study used the indoor patient admission register as a data source which may not have complete records. Further, the accuracy of coding of clinical diagnosis has not been evaluated. Thus, interpretation of diagnostic patterns must be done with caution.

Previous studies in other countries indicate that quality of care in psychiatric wards has been compromised due to increase in admission and bed occupancy rates. Scarcity of available resources and inefficiencies in their use are considered to be obstacles to better mental health, especially in low-and middle-income countries.13

Bhutan has been operating with a community psychiatric care system for more than a decade with only one psychiatric unit (ward), two psychiatrists, and four trained psychiatric nurses (without any psychologist, social workers and occupational therapists) for the entire country. Findings of the study indicate that psychiatric admissions in psychiatric ward are increasing every year and the pattern of admission is no different from other countries. There is also evidence of an increasing proportion of ‘difficult’ patients especially young men with substance use in the ward. With these findings, it suggests that special attention must be paid on more subtle issues of health professionals’ education, in-patient resources and service planning.

To provide quality care to the patients, ward design has to be adjusted. Hospital ward needs to become one element of comprehensive services and alternatives such as crisis services, day hospitals or intensive
case management teams should be available where possible. Most importantly, staff needs to be increased, trained and supported in the management of patients with severe mental illness and substance use disorders. Training the staff in psychosocial interventions and cognitive behavioural therapy for common mental disorders, screening and interventions of dual diagnosis and addictions are a vital component in assuring effective management of psychiatric patients.

To conclude, findings of the study indicate that psychiatric admissions in psychiatric ward are increasing year after year. Alcohol and drug use disorders were found to be the most common diagnosis leading to hospitalization in Bhutan. Drawing together the findings of this study it may be concluded that special attention must be paid to more subtle issues of health professional’s education, in-patient resources and service planning.

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Pandemic influenza H1N1 2009 in Thailand
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\textbf{Background:} Developing a quantitative understanding of pandemic influenza dynamics in South-East Asia is important for informing future pandemic planning. Hence, transmission dynamics of influenza A/H1N1 were determined across space and time in Thailand.

\textbf{Methods:} Dates of symptom onset were obtained for all daily laboratory-confirmed cases of influenza A/H1N1pdm in Thailand from 3 May 2009 to 26 December 2010 for four different geographic regions (Central, North, North-East, and South). These data were analysed using a probabilistic epidemic reconstruction, and estimates of the effective reproduction number, $R(t)$, were derived by region and over time.

\textbf{Results:} Estimated $R(t)$ values for the first wave peaked at 1.54 (95\% CI: 1.42-1.71) in the Central region and 1.64 (95\% CI: 1.38-1.92) in the North, whilst the corresponding values in the North-East and the South were 1.30 (95\% CI: 1.17-1.46) and 1.39 (95\% CI: 1.32-1.45) respectively. As the $R(t)$ in the Central region fell below one, the value of $R(t)$ in the rest of Thailand increased above one. $R(t)$ was above one for 30 days continuously through the first wave in all regions of Thailand. During the second wave $R(t)$ was only marginally above one in all regions except the South.

\textbf{Conclusions:} In Thailand, the value of $R(t)$ varied by region in the two pandemic waves. Higher $R(t)$ estimates were found in Central and Northern regions in the first wave. Knowledge of regional variation in transmission potential is needed for predicting the course of future pandemics and for analysing the potential impact of control measures.

\textbf{Key words:} Reproduction number, pandemic, influenza, H1N1, Thailand.

\textbf{Introduction}
Not long after the influenza A/H1N1pdm virus was identified from Mexico in April 2009, many countries in the World Health Organization’s (WHO) South-East Asia Region including India, Nepal, Indonesia and Thailand, experienced epidemics with the same strain. Those countries which submitted data to the WHO surveillance system, FluNet (www.who.int/flunet) - Bangladesh, India, Indonesia, Sri Lanka and Thailand - all

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reported polymerase chain reaction (PCR)-confirmed cases. However, quantitative analyses of the epidemic dynamics in this region have been limited. Although estimates of the initial reproduction number have been reported for Thailand and India, estimates of how reproduction numbers varied by epidemic wave and region are lacking. Quantifying such variation is important for evaluating the value of potential interventions such as school closure, vaccination and antiviral use at different time points in the epidemic, and for planning for future influenza pandemics in the region.

Reproduction numbers are a basic measure of epidemicity; they represent the average number of secondary cases generated by one typical primary case. A distinction is usually made between the basic reproduction number, \( R_0 \), which measures the mean number of secondary cases per case in an idealised population where prior immunity is entirely lacking and in the absence of control measures. The effective reproduction number, \( R(t) \), measures the number of secondary cases per case in a population at time \( t \) where immunity and control measures may be present. Because immunity, interventions and contact patterns all change over time, so does \( R(t) \). When \( R(t) \) is greater than one, i.e. when one infectious case on average produces more than one infected case, the epidemic will be increasing. The epidemic can be said to be under control when \( R(t) \) is less than one, i.e. it will either be decreasing or failing to take off despite the introduction of new cases. A higher value of \( R(t) \) indicates an epidemic where more effort might be needed to bring it under control if it is above one. Also a higher value of \( R_0 \) will be associated with a higher cumulative incidence of infection. When \( R(t) \) is below one prior to an epidemic, monitoring its value can be useful for assessing the risk of a major epidemic. However, even without interventions, \( R(t) \) will fall during an influenza epidemic as immunity increases in the population. \( R(t) \) may also vary spatially and temporally due to different contact patterns, variations in pre-existing immunity, and different atmospheric conditions.

**Influenza control measures in Thailand**

During the early stages of the pandemic, Thailand had very limited stocks of effective influenza-specific antiviral drugs, hence, these were used in a highly selective manner. Instead, school closure, masks, and hand hygiene were the main control measures used in an attempt to reduce transmission. By July 2009, as the pandemic progressed, 435 public schools in the Bangkok Metropolitan Administration (BMA) had been closed (without formal direction from the Ministry of Public Health). Overall, schools were closed for five days, from 15 to 19 July 2009. The BMA later established a comprehensive school screening programme in order to detect outbreaks of respiratory infection illnesses in the schools, and to provide information rapidly to relevant organizations to aid in the development of a control plan. For the other regions, the school closure policy was applied only to schools that had an epidemic. There was widespread use of surgical masks. Hand hygiene was promoted in schools and other public places around the end of June 2009. Health promotion materials such as leaflets, posters and billboards were distributed to all levels of the community across all regions. Self-isolation of cases at home, delays of mass gathering, hand washing and mask use were promoted. In early 2010, approximately 2 million doses of monovalent pandemic H1N1 vaccine were imported and administered to healthcare workers, pregnant women, citizens aged over 65 years of age, obese people, and
patients with high risk chronic diseases (e.g. asthma, heart diseases, mental disability). In June 2010, 2 million doses of the seasonal trivalent influenza vaccine were purchased for the same target populations, enough to cover only 3.14% of the Thai population.

Given the limited understanding of the spread of influenza A/H1N1pdm and its temporal and spatial heterogeneity in the South-East Asian Region, we conducted this study to address the question of how the effective reproduction number of influenza in Thailand varied with space and time over two epidemic waves.

**Methods**

We used as input data for the estimation procedure the dates of symptom onset of daily laboratory-confirmed cases of influenza A/H1N1pdm in Thailand from 3 May 2009 to 26 December 2010 by region - Central, North, North-East, and South (Figure 1). The total mid-year population for 2010 in Thailand was 63,701,703 people: 21,534,318 in the Central region, 11,779,330 in the North, 21,534,582 in the North-East, and 8,853,473 in the South.

The laboratory-confirmed cases were positive for influenza A/H1N1pdm 2009 viral culture by real-time PCR. The data were systematically reported through the national disease surveillance centre operated by the Bureau of Epidemiology, Thai Ministry of Public Health (MoPH).

We used the method of Wallinga and Teunis to calculate the effective reproduction number, $R(t)$.

Weekly estimates of the effective reproduction number are then obtained by averaging over corresponding daily estimates. The serial interval distribution was assumed to

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**Figure 1: Geographical locations of regions in Thailand**

![Geographical locations of regions in Thailand](image_url)
follow a gamma distribution with shape 4.17 and scale 0.33, corresponding to a mean of 2.51 days and standard deviation of 1.55 days. This distribution was derived from a contact-tracing study. Confidence intervals were calculated using a bootstrap procedure that assigned the source of each non-index case by sampling from a multinomial distribution with probabilities taken from the probability matrix. Using this procedure 1000 possible epidemic trees were constructed and used to calculate a distribution of the number of secondary cases per case for each onset date. Quantiles of this distribution were used to calculate associated 95% and 80% confidence intervals for $R(t)$.

For each region, we also calculated the predicted percentage of people infected during the first wave ($z$). Because this quantity includes both clinical and subclinical cases, it is not directly comparable with the cumulative number of laboratory confirmed cases which we expect to represent only a small fraction of true cases. If sampling is similar in all regions, however, $z$ should approximately scale with the reported cumulative cases. Calculating $z$ required solving $zR_0 = \ln\left(\frac{1}{1-z}\right)$, assuming the entire population is initially susceptible (see equation 6.22 from Bailey, 1975). We took $R_0$ to be the maximum regional value of $R(t)$ during the first wave.

**Results**

**Epidemic curves of all regions**

In Thailand, of the first 12 cases of laboratory-confirmed Influenza A/H1N1pdm virus, eleven cases (seven students aged 17-20 years and four businessmen aged 21-52 years) imported the virus from the North American continent into Thailand, mainly Bangkok and provinces in the Central region of Thailand, between 3 May and 9 June 2009. The resulting epidemic had two main waves: the first wave peaked in mid-July 2009 and lasted until October 2009; and the second wave started in November 2009 and peaked in early January 2010. Cases occurring between 3 May 2009 and 31 October 2009 were considered as belonging to the first wave, while cases with onset between 1 November 2009 and 30 April 2010 belong to the second wave.

All four regions in Thailand experienced a large first wave. During the first wave, there were 28 432 confirmed cases: 11 791 cases in the Central region, 6653 cases in the North, 6062 cases in the North-East, and 3926 cases in the South. There were 7052 confirmed cases during the second wave: 4959 cases in the Central region, 1050 cases in the North, 880 cases in the North-East, and 163 cases in the South.

In the first wave, there were 44.6 laboratory-confirmed cases per 100 000 people for the whole period. The highest peak was in the Central region (which reached 1.8 cases per 100 000 people per day on 1 July 2009) followed by the North and South (1.2 cases per 100 000 people per day in both regions, peaking on 15 July 2009 in the North and 7 July 2009 in the South) and the North-East (0.5 cases per 100 000 people per day, on 7 October 2009) (Figure 2). The Central and North regions had the steepest epidemic curves, followed by the South region. The epidemic curve in the North-East was notably flatter. It is clear that the first wave of the epidemic did not start at the same time in all regions (Figure 2), and from the timing of the epidemic curves and the peaks it appears that the epidemic started in the Central region then spread to the other three regions within a period of about 20 days, first in the North followed by the North-East and then the South. The first epidemic wave lasted for about 100 days in all regions.
The second wave was considerably smaller than the first in all regions. There were only 11.1 confirmed cases per 100,000 people for the whole country. The timing of the second wave was similar for the Central and the North regions (January to March 2010). The North-East and the South regions were hardly affected by the second wave.

The normal first semester school break in Thailand (which lasts about one month) was between the end of the first wave and the beginning of the second wave. This break was
some time after the first peak of the pandemic in all regions and also preceded the second wave. There was a public holiday that lasted for five days (4 to 8 July 2009) which was close to the peak of the epidemic for the Central region, but was before the epidemic peaks in the other three regions. The school closure in the BMA occurred around one week after the peak in the Central region (Figure 2).

Regional weekly effective reproduction number, \( R(t) \)

The earliest estimates of \( R(t) \) for all regions were unstable because of the small number of laboratory-confirmed cases and the importance of stochastic effects. Thus only the weekly estimated \( R(t) \) from 17 May 2009 onwards in the Central region (where the epidemic first took off) and from 3 June 2009 in the other regions are reported. At some time points we could not calculate the confidence intervals due to a lack of sufficient laboratory-confirmed cases. Point estimates for \( R(t) \) at these points are not reliable because of the small numbers.

As shown in Figure 3, the \( R(t) \) values for the first wave peaked at 1.54 (with 95% CI: 1.42-1.71) in the Central region and 1.64 (95% CI: 1.38-1.92) in the North, whilst the corresponding values in the North-East and the South during the first wave were 1.30 (95% CI: 1.17-1.46) and 1.39 (95% CI: 1.32-1.45) respectively. By the time that the \( R(t) \) estimate in the Central region was below one, the value of \( R(t) \) in the rest of Thailand started to increase above one. The value of \( R(t) \) was estimated to be above one continuously for 30 days in all regions. For the second wave, the \( R(t) \) estimates were only marginally above one within the first three months in all regions except the South. There were two spikes when the \( R(t) \) value in the South peaked at 4 and at 1.7 in December 2009 and February 2010. However, these estimates were derived from a very small number of cases, and the value went down below one within one week.

The associated 95% (grey band) and 80% (black band) confidence intervals in Figure 3 clearly show that the estimated \( R(t) \) values have wide CIs when there are small numbers of laboratory-confirmed cases (which is nearly the whole time period for the second wave in all regions).

Cumulative first-wave cases by region

Taking the maximum estimated regional value of \( R(t) \) from the first wave as an estimate of the basic reproduction number, \( R_0 \), and assuming everyone to be initially susceptible leads to wide predicted variation in total numbers infected (clinically or sub-clinically), ranging from two thirds of the population in the North region to approximately 40% in the North-East (Table 1). This predicted variation was found to correspond to the observed variation in the rates of laboratory confirmed cases, which were approximately twice as high in the North as in the North-East region. Moreover, the observed and predicted ordering of cumulative cases by region were identical. This would happen by chance alone with a probability of 0.042.

Discussion

The \( R(t) \) estimates of influenza A/H1N1pdm in Thailand (apart from a single anomalous week in the Southern region) were substantially lower than the estimates from the early period of the pandemic in Thailand but within the range of those estimated from other countries. The discrepancy probably reflects different assumptions about the serial interval distribution. We found that the estimates of \( R(t) \) for the first and the second waves of the influenza A/H1N1pdm epidemic in Thailand varied by region with higher estimates...
Figure 3: Estimated weekly effective reproduction number, $R(t)$ (blue dots), of all four regions in Thailand with 95% CI (black band) and 80% CI (grey band)

In the South region (bottom graph) during the third week of December 2009 the estimate of $R(t)$ is 4 (not shown on the graph), but there were insufficient data to calculate confidence intervals. Broken vertical line represents break between Wave 1 and Wave 2. CI= Confidence Interval.

reported in Central and Northern regions in the first wave. We also found that the higher the estimated maximum first-wave value of $R(t)$ was, the higher were the number of laboratory confirmed cases per 100 000.

In the WHO South-East Asia Region, India is the only other country to have reported estimates of $R(t)$. In this case, using the onset data for A/(H1N1) influenza pandemic during the period 1 June to 30 September 2009, the value of $R(t)$ at the beginning of the first wave
of the epidemic was estimated to be about 1.45 and the regional estimates were in the range 1.34-1.74. These data are in close agreement with our findings. The regional variation in both countries is particularly interesting, and if such findings can be shown to be consistent (for example by replication with seasonal influenza data) it may be worth considering to account for such regional variation in national pandemic preparedness planning. In the Thai context, if the Central region (which includes Bangkok) can be expected to be the first region affected (as was the case in 2009) and has a higher reproduction number leading to a more rapidly-spreading and sharply-peaked epidemic, concentrating initial control efforts (such as vaccination or school closures) on this region could potentially delay the spread of the epidemic to other regions. The value of such regionally-targeted control policies could be worth exploring using spatially-explicit transmission models.

The first wave estimates of $R(t)$ were always larger than the second wave estimates, almost certainly reflecting immunity resulting from sustained and widespread community transmission throughout 2009, before the pandemic vaccine was available in Thailand. Our analysis cannot quantify the impact of the five day school closure policy in the BMA on the epidemic in this region. For this, a more complex analysis with a full transmission model and higher-resolution data would be required; see, for example, Bootsma et al. However, it is interesting to observe the 5-day school closures in this region occurred with close to optimal timing; that is immediately after the epidemic peak, when $R(t)$ was less than one. By delaying school closure until this period the problem of epidemic rebound when schools re-open can be avoided. Previous model-based analysis has shown that closing and reopening schools too early has the potential to reduce the beneficial effects of this intervention or in some cases to actually increase case numbers.

Our study has some limitations. We made use of laboratory-confirmed case data. Such data will only represent a small fraction of the true cases, but this is not a major concern as our analytical methods are robust to under-reporting. Biases in our estimates could, however, arise due to temporal variation in the intensity of screening and laboratory testing. We think such temporal variation is unlikely to be significant since guidelines for collecting the samples were implemented throughout the 2009-2010 period. There are other data sources for the influenza A/H1N1pdm epidemic in Thailand including a national sentinel influenza surveillance system, hospital-based influenza like illness (ILI)

### Table 1: Regional statistics for the first epidemic wave of Influenza H1N1 2009 in Thailand

<table>
<thead>
<tr>
<th>Region</th>
<th>North</th>
<th>North-East</th>
<th>Central</th>
<th>South</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum $R(t)$</td>
<td>1.64</td>
<td>1.30</td>
<td>1.54</td>
<td>1.39</td>
</tr>
<tr>
<td>Predicted percent infected at end of first wave ($z$)</td>
<td>66%</td>
<td>42%</td>
<td>61%</td>
<td>50%</td>
</tr>
<tr>
<td>Laboratory-confirmed cases observed per 100 000 in the first wave</td>
<td>56.5</td>
<td>28.2</td>
<td>54.7</td>
<td>44.3</td>
</tr>
</tbody>
</table>

The predicted percent infected at the end of the first wave assumes everyone is initially susceptible to infection and takes the basic reproduction number, $R_0$, as the maximum estimated value for $R(t)$. The predicted percent infected at the end of the first wave is not a major concern as our analytical methods are robust to under-reporting. However, it is interesting to observe the 5-day school closures in this region occurred with close to optimal timing; that is immediately after the epidemic peak, when $R(t)$ was less than one. By delaying school closure until this period the problem of epidemic rebound when schools re-open can be avoided. Previous model-based analysis has shown that closing and reopening schools too early has the potential to reduce the beneficial effects of this intervention or in some cases to actually increase case numbers.
surveillance and suspected case data (which includes cases of acute febrile respiratory illness with onset within seven days of close contact with a confirmed case, or within seven days of travel to a community where there are confirmed cases, or living in a community with one or more confirmed cases). All these different sources of data have indicated the same pattern of pandemic waves in Thailand, providing reassurance that our input data are representative. A further potential limitation is that we based our estimates on aggregated data at the regional level and did not take into account possible age-related variations in transmissibility. Under-reporting of cases can bias estimates of the reproduction numbers if reporting rates are not equal across the different age groups. Another potential source of bias arises from changes in serial interval distribution during the epidemic. Under simulation studies have shown that such effects can be important, they also show that biases will be small when reproduction numbers are small, as is the case here. An additional limitation is the relatively coarse spatial resolution in our data. It is possible, for example, that more sharply peaked and shorter first wave epidemic curves in the Central and Southern regions reflect tighter coupling of sub-populations within these regions. The longer and flatter epidemic curves in the North and North-East might reflect reduced movement between subpopulations in these regions resulting in reduced synchronization of local epidemics.

Heterogeneity in population distribution is believed to be a significant factor affecting the spatial spread of directly transmitted pathogens at different scales. However, one study in France concluded that during the initial phase of an influenza epidemic, geographical space and heterogeneities in population distribution were not important factors in the spread of disease; geographical space only becoming relevant to the spread of the influenza epidemic in the few weeks around the epidemic’s peak. Another study has suggested that the regional spread of infection correlates more closely with rates of movement of people to and from their workplaces rather than with geographical distance, enabling influenza to spread rapidly beyond local spatial constraints. Our work suggests, in contrast, that accounting for regional variation in transmission potential (which might arise from differing contact patterns, or atmospheric conditions in different parts of the country) may be important for both predicting the course of future pandemics and for analysing potential control measures for future pandemics.

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References


Behavourial risk factors of men associated with transmission of sexually transmitted infections (STIs) in Sri Lanka

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**Background:** Unprotected sex is a major risk factor for transmission of sexually transmitted infections (STIs). We explored the behavioural risk factors for STIs among men who presented with STI-related symptoms.

**Methods:** A systematic sample of 112 males presenting with STI symptoms at district sexually transmitted disease (STD) clinic located in Kandy, Sri Lanka were enrolled during 2009. They were interviewed using a semi-structured questionnaire. Selected sexual behaviours were discussed with them in greater detail. The chi-square and difference-in-two-proportion tests were used for testing the statistical significance for quantitative data, and qualitative methods were used for the analysis of responses to open-ended questions and in-depth discussion.

**Results:** The median age of the respondents was 28 years. The majority of them (56%) had never been married. The median age at the first sexual intercourse was 22 years. The majority (87%) of respondents had their first intercourse before marriage; mostly with older females. Most (103, 92%) men reported having sexual intercourse during the past six months; of them, 40.8% had sex with multiple partners. Only 18.5% used condoms at the first premarital intercourse. The consistent use of condoms with non-marital partners during the past six months was only 13.7%. Common reasons for non-use of condoms were: belief that partner was faithful; poor knowledge about risk of unprotected sex; view that condoms reduce pleasure and negatively affect intimacy; and inhibition in accessing condoms in public.

**Conclusions:** Sexual behaviours were found to be risky among men attending STD clinics in Sri Lanka. Strategies of sexual health promotion among vulnerable groups should be evaluated for planning proper interventions.

**Key words:** Sexual behaviours, male, pre-marital sex, condom use, sexually transmitted infections, Sri Lanka.

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**Introduction**

In developing countries sexually transmitted infections (STIs) and their complications rank among the top five disease categories for which adults seek health care.\textsuperscript{1} Control of STIs has received renewed attention during the
last few decades, following the emergence of HIV as a major public health problem around the world. There is a strong link between common STIs and sexual transmission of HIV.\(^1\) The spread of STIs including HIV is directly influenced by a number of biological and behavioural determinants, which in turn are influenced by a number of other factors such as demographic, socioeconomic and cultural characteristics of the individual person and the populations in which they live.\(^2\) In Sri Lanka, sexual behaviour has been studied in many population groups that are often considered as vulnerable for HIV. According to these studies, men reported a significantly higher involvement in risky sexual behaviour compared with their female counterparts.\(^3\)\(^-\)\(^5\) Rawstorne and Worth reported in 2007 that sexual behaviour varied considerably among different vulnerable groups with some groups showing high levels of risk for HIV due to unprotected sex with casual and regular partners in Sri Lanka.\(^6\)

The National STD/AIDS Control Programme in Sri Lanka routinely collects only the baseline characteristics of persons seeking STI and HIV care in government STD clinics. However, available data do not adequately describe the factors associated with transmission of these infections in local communities. Lack of such information is a challenge while developing a comprehensive strategy to control STIs and HIV. Reliable data on human sexual behaviour are not easy to collect. The quality of such data could vary depending on the study type, study population, study setting, and data collection method. In a clinic set up at the time of medical consultation, respondents may disclose complete information related to their sexual behaviour than in a large community survey. Thus, this study aimed to explore sexual behaviours of men seeking care in a government STD clinic in order to understand behavioural risk factors of men associated with transmission of STIs in Sri Lanka.

**Methods**

This descriptive study was conducted in the district STD clinic of Kandy in Sri Lanka. The study was approved by the Ethical Review Committee of the Faculty of Medicine, University of Peradeniya, Sri Lanka. One hundred and twelve new male clinic attendees with STI-related complaints were interviewed from 1 January to 30 June 2009. The main register of male clinic attendees was used as the sampling frame. The study sample was selected using a systematic random sampling method after excluding the cases of sexual abuse.

The Principal Investigator of the study - a medical officer having patient counselling skills in the same clinic, interviewed all the selected study subjects at the time of the first medical consultation. The respondents were explained individually that the information collected from them would be treated with confidentiality before obtaining voluntary consent for their participation in the study. At the interview, privacy was ensured and respondents were given adequate time to share their information and feelings with the investigator. A detailed account of presenting complaint, socio-demographic profile, substance abuse, present and past sexual practices including use of condoms, and knowledge about STIs/ AIDS and safe sexual practices was obtained by using a semi-structured questionnaire with a number of open-ended questions. Each interview was also accompanied by a discussion so as to gather more information on selected behaviours. Responses were cross-checked where necessary to improve the reliability of data. Subsequently, individuals underwent the routine examination and collection of necessary specimens to diagnose STIs including HIV.
Statistical analysis

This study collected both quantitative and qualitative data from the respondents. The qualitative data were mainly derived from open-ended questions and discussions held with respondents on selected variables. The quantitative data were entered into an “Excel” worksheet and analysed using descriptive statistics. The Minitab-14 statistical software was used for comparisons. The qualitative data were appropriately used where necessary to complement the quantitative data.

Results

The median age of the sample was 28 years. The majority (76%) of respondents were in the age group of 16-35 years. Most (93.7%) respondents had completed education up to the tenth grade or above. Fifty five per cent respondents were never married. Most (87%) respondents were currently employed (Table 1). Sixty per cent respondents were current smokers and 91% had taken alcohol at a social event. Thirteen per cent were currently taking narcotic substances while another 24% had tried these at least once in the past. However, no one reported to having injected these drugs.

The median age for the first penetrative sexual intercourse was 22 years. Forty two (37.5%) men had initiated sexual intercourse between the age of 15–20 years. One respondent denied ever having penetrative sex. The first sexual partners were - girl friends (32, 28.8%); casual female partners (27, 24.3%); sex workers (27, 24.3%); marital partners (14, 12.6%); female relatives (2, 1.8%); and casual homosexual partners (9, 8.1%). Ninety-seven (87%) respondents had the first sexual intercourse before marriage. The majority (53.6%) of them had sex with an older female partner. The interview also revealed that many respondents hardly had any information about their casual sex partners while a substantial number of them stated that they had sex with those women who returned from foreign employment. When the respondents were asked to provide information about the type of sex they had in their first penetrative sexual intercourse, a majority 64(57.6%) of them reported vaginal sex only while 35(31.5%) reported vaginal and oral intercourse. Very few had anal sex with female partners while 6(5.4%) had anal sex with male partners. Only 18.5% used condoms at the first sexual intercourse with non-marital partners and it was mainly confined to vaginal sex.

The interviews further revealed that some men who initiated penetrative sex with commercial sex workers and casual partners already had their own girl friends. However, these men never had penetrative sex with their girl friends. According to them, their girl friends had frequently resisted penetrative sex with them mainly to protect virginity and to avoid premarital conception. It was also revealed that some respondents had selected a casual partner or sex worker to initiate penetrative sex in order to test their sexual virility before entering into sexual relationship with their regular partner. Some men practised a range of non-penetrative sex methods with their girl friends before having full penetrative sex with other women.

Sexual practices of respondents during the past six months were also enquired into. One hundred and three (92%) respondents reported penetrative sexual intercourse during this period (Table 2). Among them, a significantly higher proportion of never-married men (77.4%) than married men (50%) had sexual intercourse with non-regular partners (p 0.002). With regard to the use of condoms during the past six months, only 13.8% had consistently used condoms. And 58.8% had never used condoms with
their partners outside the marital relationship (Table 2). A statistically significant difference was not observed between married and unmarried men with respect to non-use of condoms with non-marital partners (p 0.4). The reasons for non-use of condoms were the belief that the partner was faithful; lack of knowledge about the risk of unprotected sex; view that condoms harmed pleasure and intimacy; and inhibition to accessing condoms in public. We further analysed condom use with different partner categories using data for the last sexual intercourse outside marital relationship (Table 3). Condoms were used more frequently with the commercial sex workers (53.6%) than with casual (12.2%) and regular (14.4%) partners (p <0.01).

The study also explored whether men consumed alcohol or narcotics before or during sex. Only 5% admitted to having consumed these substances during or before sex. On further enquiry, 14% stated that they used tablets to prolong the duration of sexual intercourse. However, none of these men had evidence of erectile dysfunction. Further, it was revealed that a proportion of the aphrodisiac tablet users believed that their ejaculating time was too short; therefore, they took these tablets to hide their perceived sexual dysfunction. Married men hardly reported having a strained family life. The common reasons given by these men for having extramarital sex were lack of responsiveness of the regular partner and to enjoy a different type of sexual experience in addition to the regular one.

Table 1: Socio-demographic characteristics of respondents

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Level of education</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not gone to school</td>
<td>2</td>
<td>1.8</td>
</tr>
<tr>
<td>Up to grade 5</td>
<td>5</td>
<td>4.5</td>
</tr>
<tr>
<td>Up to grade 10</td>
<td>96</td>
<td>85.7</td>
</tr>
<tr>
<td>More than grade 10</td>
<td>9</td>
<td>8.0</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never married and not having a partner</td>
<td>45</td>
<td>40.2</td>
</tr>
<tr>
<td>Never married and having a partner</td>
<td>17</td>
<td>15.2</td>
</tr>
<tr>
<td>Married and living with spouse</td>
<td>50</td>
<td>44.6</td>
</tr>
<tr>
<td>Widowed / separated / divorced</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Occupation</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Skilled and non-skilled labourers</td>
<td>45</td>
<td>30.4</td>
</tr>
<tr>
<td>Security personnel</td>
<td>19</td>
<td>17.0</td>
</tr>
<tr>
<td>Small businessmen</td>
<td>15</td>
<td>13.4</td>
</tr>
<tr>
<td>Drivers</td>
<td>10</td>
<td>9.0</td>
</tr>
<tr>
<td>Hotel workers</td>
<td>10</td>
<td>9.0</td>
</tr>
<tr>
<td>Other occupations</td>
<td>9</td>
<td>8.0</td>
</tr>
<tr>
<td>Students</td>
<td>7</td>
<td>6.2</td>
</tr>
<tr>
<td>Unemployed</td>
<td>8</td>
<td>7.0</td>
</tr>
</tbody>
</table>
Table 2: Reported sexual behaviour of respondents during the past six months

<table>
<thead>
<tr>
<th>Sexual behaviour</th>
<th>Never married n (%)</th>
<th>Married n (%)</th>
<th>Total n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Number of partners</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One (girl friend / spouse)</td>
<td>7(11.3)</td>
<td>23(46.0)</td>
<td>30(26.8)</td>
</tr>
<tr>
<td>One (non-regular)</td>
<td>30(48.4)</td>
<td>1(2.0)</td>
<td>31(27.7)</td>
</tr>
<tr>
<td>Two or more</td>
<td>18(29.0)</td>
<td>24(48.0)</td>
<td>42(37.5)</td>
</tr>
<tr>
<td>None</td>
<td>7(11.3)</td>
<td>2(4.0)</td>
<td>9(8.0)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>62(100.0)</td>
<td>50(100.0)</td>
<td>112(100.0)</td>
</tr>
<tr>
<td><strong>Frequency of using condoms with non-marital partners</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Every time</td>
<td>10(18.5)</td>
<td>1(3.8)</td>
<td>11(13.7)</td>
</tr>
<tr>
<td>Sometimes</td>
<td>14(25.9)</td>
<td>8(30.8)</td>
<td>22(27.5)</td>
</tr>
<tr>
<td>Never</td>
<td>30(55.6)</td>
<td>17(65.4)</td>
<td>47(58.8)</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>54(100.0)</td>
<td>26(100.0)</td>
<td>80(100.0)</td>
</tr>
</tbody>
</table>

Over 90% respondents had heard about AIDS and STIs. However, their knowledge about transmission of these infections was poor. They often thought that having sex with a casual partner is safer than sex with a commercial sex worker. When the respondents were asked about the best method to have safe sexual intercourse, majority of them (72%) stated the use of condoms followed by sex with a faithful partner (4%) and avoiding vaginal sex (4%). Many of those who talked about condoms were not aware that oral and anal sex without condoms is also risky. Twenty per cent men never stated any method of practising safe sex. The majority (94%) of respondents and their sex partners never enquired from each other about their HIV and STI status before or after having sex. They thought that asking about such information would harm their relationship. In the study sample, 67(60%) were found to have STIs according to the clinical manifestations and laboratory investigations.

Table 3: Condom use in different partner categories at the last intercourse outside the marital relationship

<table>
<thead>
<tr>
<th>Partner type</th>
<th>Condom use</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Yes n (%)</td>
<td>No n (%)</td>
<td></td>
</tr>
<tr>
<td>Sex worker</td>
<td>15(53.6)</td>
<td>13(46.4)</td>
<td></td>
</tr>
<tr>
<td>Casual</td>
<td>6(12.2)</td>
<td>43(87.8)</td>
<td></td>
</tr>
<tr>
<td>Regular (non-marital)</td>
<td>4(14.3)</td>
<td>24(85.7)</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>25(23.8)</td>
<td>80(76.2)</td>
<td></td>
</tr>
</tbody>
</table>

chi² = 18.6, df = 2, p <0.01
Discussion

Premarital sex including early initiation of sexual intercourse is a public health problem worldwide. Literature reveals that risky sexual practices are consistently higher among men than their female counterparts in Sri Lanka. Promoting safe sex among men could therefore make a large contribution to the control of STIs including HIV.

Our study sample comprised fairly educated people (Table 1). In Sri Lanka, the human reproductive system is taught in grades 9 and 10 in schools. However, risky sexual behaviours reported by the respondents were mainly related to lack of knowledge or ignorance about the correct safe sex practices. Use of condoms was extremely low with all types of sexual partners except with commercial sex workers. This probably indicates that people tend to use condoms with partners perceived to be at high risk but not with those perceived to be safe. Sex with commercial sex workers is frequently considered as unsafe. Some sex workers also carry condoms and insist that clients use them. Rawstorne and Worth in 2007 also reported a similar pattern of condom use in other population groups studied, namely three-wheel drivers, drug users and male factory workers of Sri Lanka.

A substantial proportion of men felt inhibited to access condoms in public. In Sri Lankan culture people frequently link the use of condoms with promiscuity or illicit sex. As a result, some of those who wish to have safe sex would go for unprotected sex unless a condom is secretly accessed. Non-use of condoms may also have a symbolic function reflecting the intimacy of the relationship. Thus some people who try to show their intimacy to their non-regular partners become vulnerable to STIs and HIV. This study also revealed that a proportion of never-married men, who had their own girl friends, had penetrative sex with commercial sex workers and casual partners for various reasons. This should be a serious concern because men who acquire infections through such practices may subsequently transmit infections to their spouses after their marriage. It was also observed that a majority of married men who had extramarital sex hardly had a strained family life. This perhaps indicates a decreasing significance of marriage and family in regulating sexual behaviour in a section of the present society. However, this type of behaviour cannot be considered “sexual liberation” as such but rather a factor that enhances vulnerability for STIs and HIV.

The social stigma attached to HIV (including other STIs) and discriminative practices in health-care settings seriously challenge the control of these infections in Asian countries. Stigmatization of these infections was also manifested among the respondents of this study as majority (94%) of them avoided asking their sexual partners about the STI and HIV status before or after sexual contact. A substantial proportion of men were taking self-medication to prolong their sexual act or to hide their perceived sexual dysfunction. The lack of knowledge about sex organs and the natural process of sexual intercourse probably encourages such practices leading to a higher risk of sexually-transmitted infections.

The coexistence of alcohol use and sex has the potential to increase risks associated with sexual intercourse. WHO has reported a strong coexistence of alcohol use and sexual behaviour in a cross-cultural study conducted in eight countries. Our study showed that only 5% of the sample had alcohol before or during sexual intercourse. However, data generated from this study are not adequate to comment on relationship between sex and use of alcohol. The sample of this study by and large represented the low and middle socioeconomic level. Thus data on high-risk
The sexual practices of the higher socioeconomic class were probably underrepresented. The reasons for extremely low representation of the higher socioeconomic class in the study population could be the low incidence of STI-related symptoms in them or that they go to the private sector for treatment.

The Sri Lankan culture does not approve premarital and extramarital sex as a norm. A national survey in 1996 reported that more than 90% youths in the 16 – 29 year age group did not approve premarital sex under any circumstances. Although the sample of this study is not fully representative of the population at large, the results indicate that there is a considerable gap between the publicly accepted sexual norm and the actual behaviour. Most men were either unaware or ignorant of the correct information about safe sexual practices. To achieve better control of STIs and AIDS in Sri Lanka, the deficits in sexual health promotion among vulnerable populations should be carefully identified and addressed.

Acknowledgements
We sincerely thank the respondents for their voluntary participation. We are grateful to the clinic staff of the STD clinic in Kandy, Sri Lanka for their support.

References


Risk factors of childhood tuberculosis: a case control study from rural Bangladesh

Mohamed R Karim¹, Mohamed A Rahman¹, Shaikh AA Mamun¹, Mohamed A Alam¹ & Shahnaz Akhter²

Background: Childhood tuberculosis (TB) is one of the major causes of childhood morbidity and mortality; however, it is relatively a neglected disease. Hence, we explored the risk factors for childhood TB.

Methods: Ninety-five cases and 94 controls were selected during January to May 2011 from DOTS centres located in four sub-districts of Bangladesh. The exposure status of recently diagnosed childhood TB patients (<18-year-olds), who were sputum-positive, were compared with children who were sent to the laboratory with suspected tuberculosis but were found to be sputum-negative. Data were collected by a structured questionnaire. Crude odds ratios (OR), adjusted odds ratio (AOR) and 95% confidence intervals (CI) were estimated. Stepwise logistic regression model was used to identify independent predictors.

Results: Children under 14 years of age (AOR: 0.25; 95% CI: 0.10-0.66), having completed primary education (AOR: 0.28; 95% CI: 0.10-0.74), whose fathers’ were in business or service (AOR: 0.24; 95% CI: 0.08-0.72), and who slept in a less crowded room (AOR: 0.32; 95% CI: 0.14-0.76), lived in a house with a separate kitchen (AOR: 0.39; 95% CI: 0.16-0.96) had less chance of having TB. Those who had contact with cases of TB among relatives or neighbours were less likely to have TB (AOR: 0.28; 95% CI: 0.16-0.70) compared to those who had contact with a TB case in the family.

Conclusion: Age, education, father’s occupation, crowding, kitchen location and intimate contact with a TB case were significantly associated with smear-positive childhood TB.

Key words: Tuberculosis, children, risk factors, prevention, Bangladesh.

Introduction

In today’s world, tuberculosis (TB) continues to contribute to an unacceptably high toll of disease and death among children. Of the 9.2 million new tuberculosis cases, about one million (11%) are children. Childhood tuberculosis carries much higher risk of severe disease and death among young children than adults.¹-³ It is now estimated that every year 300 000 people in Bangladesh develop active tuberculosis; children aged less than 14 years constitute only 3% of them. Childhood tuberculosis is under-reported in Bangladesh due to difficulties in confirming diagnosis, lack

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of guidelines for systematic screening and referral of suspected childhood TB cases. High prevalence of malnutrition renders the skin test for TB ineffective and lack of laboratory facilities is also an impediment for diagnosis of children with TB. Absence of awareness about TB in children also plays a role in the low detection rate of the disease.4-8

Risk of childhood tuberculosis depends on the probability, duration, and proximity of exposure to an infectious case, and also the infectiousness of the source cases (usually an adult with active pulmonary disease, although older children may also contribute to transmission). Studies have shown that younger children (<5 years) who were contacts of TB cases had significantly greater likelihood of being infected with increasing smear-positivity. The risk of positive Tuberculin Skin Test response in children increased with household TB infection proximity and with the degree of activities shared with the individual with tuberculosis.9,10

Malnutrition and tuberculosis are two problems which tend to interact with each other. Malnutrition increases the host’s susceptibility to infection especially in case of children. Both, protein-energy malnutrition and micronutrient deficiencies increase the risk of tuberculosis.11 Social factors, community TB prevalence and age determine where exposure is most likely to occur and may vary between communities. Children under 14 years of age have a lower risk of developing active TB compared to those above 14 years. A household TB case is most commonly implicated for infection among young children. Older children are increasingly likely to be infected from outside the household. Poverty, lack of education, poor housing, urban environments and overcrowding are all associated with increased transmission.12-15 Studies reported that use of biomass fuel for cooking substantially increases the risk of tuberculosis. Studies have also shown that this effect is reduced when availability of a separate kitchen, house type, indoor crowding, age, gender, urban or rural residence, etc. are statistically adjusted.16

In Bangladesh, childhood tuberculosis is a relatively neglected problem and factors responsible for its aggravation have not been studied adequately. This study was conducted to determine the risk factors that may be helpful in taking preventive measures against childhood tuberculosis to reduce morbidity and mortality related to this disease.

Methods
This case control study was carried out to identify risk factors for tuberculosis among children (<18-year-olds). The exposure status of recently-diagnosed childhood TB patients, who were sputum-positive at the peripheral laboratory were collected and compared with the exposure information of the children who were sent to the laboratory with suspected tuberculosis but were sputum-negative. Cases were diagnosed as TB patient at four sub-district DOTS service centres (Trishal, Bhaluka, Gofargaon, from Mymensingh, and Kapasia from Gazipur districts of Bangladesh) from January to May, 2011. Children who visited the DOTS laboratory but were sputum-negative during the same time period were taken as control. Addresses were taken from the sputum microscopy register with a view to trace study subjects at home for exploring exposure information.

Sample size was determined using Epi-info software assuming anticipated probability of “exposure” given “no disease” 32%, anticipated odds ratio 2.44, 5% level of significance and 80% power. Estimated sample size was 91 cases and 91 controls. A total of 95 childhood tuberculosis patients (cases) and 94 controls were enrolled in the study. Each of the respondents was informed about
the objective of the study. They were assured about confidentiality prior to taking verbal consent. Data were collected by a researcher in face-to-face interviews using a structured questionnaire and by reviewing records. All the questionnaires were checked for consistency and completeness. A subset of questionnaires was also re-checked in the field.

Operational definitions

Literacy was determined by asking whether a respondent ever had education in any institution or not. The occupational status of the parents was collected in all possible categories and afterwards these were combined into two broad categories. Change in the composition of the family was determined by regular or irregular displacement of family members from their residence. Person per bedroom was calculated and then this variable was categorized taking two groups, i.e. \( \leq 2 \) persons, and \( > 2 \) persons per bedroom.

Household condition was assessed by the type of materials used for the floor, wall and roof of the house. It was first classified into very poor, poor, average, and good, which was further summarized as poor and good category. The location of the kitchen was taken as a proxy variable for “exposure to household smoke”. A kitchen attached to the house or indoor cooking arrangement was termed as “in-house kitchen”. Cooking outside, e.g. courtyard, shed etc. was termed as “outside kitchen”. A kitchen with windows and chimney (vent for expulsion of smoke), positioned separately in the house was stated as a “separate kitchen”. In rural Bangladesh, almost all the houses are constructed as mono-unitary spaces which are subsequently partitioned into several spaces based on utility and requirements (sleeping space, store place etc.). The number of windows per house was taken as a proxy for bedroom ventilation status.

The information on contact with a TB patient was collected as four different states; (i) Patients reported no contact; (ii) Patients who reported casual contact (e.g. sharing a transport route regularly or living in the same subdistrict); (iii) Patients who reported knowing each other by name, but had casual contact; and (iv) Patients who knew each other well and had prolonged or intimate contact (e.g. family members, friends). Based on the relationship and proximity of source cases, contact status was further subdivided into two categories, i.e. contact with family members, and contact with relatives/ neighbours. Duration of contact with a tuberculosis patient was recorded in months. Those who could not understand this issue and who responded “do not know” were excluded while analyzing contact exposure data.

Statistical analysis

The data were entered, cleaned and edited using SPSS programme. Statistical tests (\( \chi^2 \)) were performed to determine the association between exposure and outcome variables. The Yate’s corrected values were considered significant at a p value of \( < 0.05 \). Crude odds ratios (OR) and 95% confidence intervals (CI) were estimated in the univariate analysis. Important predictors of univariate analysis were included in a stepwise logistic regression model to identify independent predictors. Adjusted odds ratios (AOR) and 95% CI were reported.

Results

Almost all the households of the respondents used tubewell water for drinking and cooking. Seventeen percent of the households (32/189) used kerosene lamp for lighting and the rest of the households had electricity. The mean age of the respondents was about 14 years (Figure 1), and 52% were females.
In univariate analysis, educational status of the children was found to be associated with TB (p 0.006) (Table 1). It is important to mention that seven of the study children were illiterate, and all of them had tuberculosis. Fathers’ educational status as well as occupational status did not have a significant association. However, association with maternal education was statistically significant (p 0.002). Almost all the respondents (96%) were permanent residents who lived in their own houses. Childhood tuberculosis was found to be related with regular or irregular displacement of the family members (changes in composition) (p 0.001). Bedroom occupancy (persons per bedroom) was statistically significantly associated with childhood tuberculosis (p <0.001) (Table 1).

Several household conditions showed association with childhood tuberculosis in univariate analysis (Table 2). Children living in families having only one bedroom had a greater chance of developing tuberculosis than those possessing two or more bedrooms (p <0.0001). The location of the kitchen was found to be significantly associated with childhood TB (p 0.001). Children living in houses with the kitchen inside the house were more likely to develop tuberculosis than those living in houses with a separate kitchen or when cooking was done outside the house. Children exposed to family members having TB were five times more likely to develop tuberculosis than those who came in contact with relatives or neighbours suffering from tuberculosis (p <0.0001). History of contact
with a TB case for two years or more had three times more chance of having tuberculosis than those who had a shorter contact history (p<0.005).

In univariate analysis, several socio-demographic and household-related factors were found to be associated with childhood tuberculosis. Hence, a binary logistic regression model was constructed to find out the predictors of childhood tuberculosis adjusting for other factors (Table 3). The predictors in the model revealed that children less than 14 years of age were more likely to develop tuberculosis compared to children aged 14 years and above (crude odds ratio 0.63, 95% CI 0.35-1.13, p=0.16). In addition, females had a lower risk of developing tuberculosis compared to males (crude odds ratio 0.64, 95% CI 0.36-1.14, p=0.17). Children with mothers who were literate had a higher risk of developing tuberculosis compared to those with mothers who were illiterate (crude odds ratio 2.65, 95% CI 1.45-4.86, p=0.002*). Children with fathers who were daily labourers had a lower risk of developing tuberculosis compared to those with fathers who were in business and service (crude odds ratio 0.59, 95% CI 0.32-1.08, p=0.12). Children with families that had a regular change in composition had a lower risk of developing tuberculosis compared to those with families that had an unchanged composition (crude odds ratio 0.26, 95% CI 0.12-0.58, p=0.001*). Children living in households with more than two persons per bedroom had a higher risk of developing tuberculosis compared to those living in households with two persons or less per bedroom (crude odds ratio 0.30, 95% CI 0.17-0.56, p<0.001*).

### Table 1: Association of socio-demographic characteristics with childhood TB

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Controls N=95</th>
<th>Cases N=94</th>
<th>Crude odds ratio (95%CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†14 years and above</td>
<td>35(43)</td>
<td>46(57)</td>
<td>0.63(0.35-1.13)</td>
<td>0.16</td>
</tr>
<tr>
<td>Less than 14 years</td>
<td>59(55)</td>
<td>49(45)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Sex</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Female</td>
<td>43(44)</td>
<td>54(56)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>51(55)</td>
<td>41(45)</td>
<td>0.64(0.36-1.14)</td>
<td>0.17</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Pre-primary</td>
<td>17(33)</td>
<td>35(67)</td>
<td>0.38(0.19-0.74)</td>
<td>0.006*</td>
</tr>
<tr>
<td>Primary and above</td>
<td>77(56)</td>
<td>60(44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mothers’ education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Illiterate</td>
<td>47(64)</td>
<td>26(36)</td>
<td>2.65(1.45-4.86)</td>
<td>0.002*</td>
</tr>
<tr>
<td>Literate</td>
<td>47(41)</td>
<td>69(59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Mothers’ occupation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Housewife</td>
<td>88(52)</td>
<td>80(48)</td>
<td>2.75(1.02-7.43)</td>
<td>0.07</td>
</tr>
<tr>
<td>Other</td>
<td>6(29)</td>
<td>15(71)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fathers’ education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Pre-primary</td>
<td>38(58)</td>
<td>27(42)</td>
<td>1.71(0.93-3.14)</td>
<td>0.11</td>
</tr>
<tr>
<td>Primary and above</td>
<td>56(45)</td>
<td>68(55)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fathers’ occupation</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Daily labourer</td>
<td>55(45)</td>
<td>67(55)</td>
<td>0.59(0.32-1.08)</td>
<td>0.12</td>
</tr>
<tr>
<td>Business and service</td>
<td>39(58)</td>
<td>28(42)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Family composition</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Change (regularly)</td>
<td>65(43)</td>
<td>85(57)</td>
<td>0.26(0.12-0.58)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Unchanged</td>
<td>29(74)</td>
<td>10(26)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Persons per bedroom</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†More than two persons</td>
<td>42(38)</td>
<td>69(62)</td>
<td>0.30(0.17-0.56)</td>
<td>&lt;0.001*</td>
</tr>
<tr>
<td>Two persons or less</td>
<td>52(67)</td>
<td>26(33)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

† reference category, * statistically significant, CI = confidence interval
Table 2: Association of household characteristics and contact with TB case with childhood TB

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Controls N=95</th>
<th>Cases N=94</th>
<th>Crude odds ratio (95%CI)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household condition</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Poor</td>
<td>42(47)</td>
<td>48(53)</td>
<td></td>
<td>0.5</td>
</tr>
<tr>
<td>Good</td>
<td>52(53)</td>
<td>47(47)</td>
<td>0.79(0.45-1.4)</td>
<td></td>
</tr>
<tr>
<td>Bedroom category</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>One bedroom</td>
<td>59(41)</td>
<td>86(59)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two or more bedrooms</td>
<td>35(79)</td>
<td>9(21)</td>
<td>0.18(0.08-0.39)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Kitchen position</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†In-house kitchen</td>
<td>21(30)</td>
<td>50(70)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outside kitchen</td>
<td>13(59)</td>
<td>9(41)</td>
<td>0.29(0.11-0.78)</td>
<td></td>
</tr>
<tr>
<td>Separate kitchen</td>
<td>60(63)</td>
<td>36(37)</td>
<td>0.25(0.13-0.49)</td>
<td>0.001*</td>
</tr>
<tr>
<td>Contact with TB case</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†In the family</td>
<td>18(26)</td>
<td>52(74)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relatives/neighbors</td>
<td>76(64)</td>
<td>43(36)</td>
<td>0.20(0.10-0.38)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Duration of contact with TB case</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>†Less than two years</td>
<td>22(69)</td>
<td>10(31)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Two years or more</td>
<td>33(38)</td>
<td>54(62)</td>
<td>0.28(0.12-0.66)</td>
<td>0.005*</td>
</tr>
</tbody>
</table>

† reference category, * statistically significant, CI = confidence interval

Table 3: Predictors for smear-positive childhood tuberculosis: logistic regression

<table>
<thead>
<tr>
<th>Predictors*</th>
<th>Adjusted odds ratio</th>
<th>95% CI</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Child less than 14 years of age</td>
<td>0.25</td>
<td>0.10-0.66</td>
<td>0.005</td>
</tr>
<tr>
<td>Respondents education - primary and above</td>
<td>0.28</td>
<td>0.10-0.74</td>
<td>0.01</td>
</tr>
<tr>
<td>Mother’s education - literate</td>
<td>1.35</td>
<td>1.06-1.73</td>
<td>0.01</td>
</tr>
<tr>
<td>Father’s occupation - service and business</td>
<td>0.24</td>
<td>0.08-0.72</td>
<td>0.01</td>
</tr>
<tr>
<td>Two or less persons per room</td>
<td>0.32</td>
<td>0.14-0.76</td>
<td>0.009</td>
</tr>
<tr>
<td>Outside kitchen</td>
<td>0.17</td>
<td>0.05-0.61</td>
<td>0.007</td>
</tr>
<tr>
<td>Separate kitchen</td>
<td>0.39</td>
<td>0.16-0.96</td>
<td>0.04</td>
</tr>
<tr>
<td>Contact with TB case - relatives/neighbors</td>
<td>0.28</td>
<td>0.16-0.70</td>
<td>0.006</td>
</tr>
</tbody>
</table>

*Reference categories shown in table 1 and 2, CI = confidence interval, Logistic Regression: Cox & Snell R² = 0.36, Nagelkerke R² = 0.49, model $\chi^2_{(6)}$ = 76, p <0.0001
age had four times lower risk of developing TB compared to children 14 years or older. Those who had completed primary education had three times less chance to develop childhood TB than the illiterate children. Mothers’ education had a significant positive association with childhood TB (Adjusted OR: 1.35; 95% CI: 1.06-1.73). Fathers’ occupation as labourer had significant risk for childhood TB. Children sleeping in a less crowded environment (two or less persons per room) had three times less chance of having TB. Children residing in houses with an outside kitchen or a separate kitchen had five times and 2.5 times lower risk of developing childhood TB respectively compared to those having a kitchen inside the houses. Contact with a TB case in the family carried a higher risk than contact with a TB case among relatives or neighbours. There were nine children who had no BCG scar and eight of them had active tuberculosis.

Discussion

According to national statistics of Bangladesh, the male to female ratio is 2:1 among TB patients below 14 years of age. In this study, the frequency of male and female child TB cases was almost equal in the age category of 14 years or less but child TB cases were two times higher in girls than boys in the more than 14 years age category (Figure 2) which is consistent with other reports. It is important to note that, girls who develop tuberculosis at the start of their reproductive age are difficult to trace after marriage as their family may conceal the disease status for various social reasons (stigma). This situation increases the chance of spreading tuberculosis in a new setting (husband’s family) and also imposes long-term risk on her nutritional and reproductive status. In this study a higher proportion of cases were among older children (>14 years) which corresponds with a previous study.

Educational level of the children was low among cases than the controls. National data show that 51% children have completed the primary level of education. The study showed that children of literate mothers had a greater chance of developing tuberculosis which contradicts a previous study. Literate mothers are supposed to have better health seeking behaviour than their illiterate counterparts.

Children of daily labourers faced a higher risk of TB than those hailing from better occupational categories. Other studies have
also shown that childhood TB in different economic groups in the community tends to vary inversely with their economic levels.\textsuperscript{11,19} Increased size of the household was found to be important and overcrowding has been documented as a risk factor for TB in several studies in a variety of settings.\textsuperscript{10,19,20} Measurement of the bedroom area may not reflect the actual usable bedroom space because in a rural setting, it is always occupied by some furniture, utensils, stored crops, agricultural tools, bundles of firewood, jute-straw, and sometimes pet animals. The number of windows reflects a vague expression of ventilation status (there are many variables regarding window(s), such as: size of the window, position or placement, how often it is kept open, window material – glass, wood or metal, etc.). Children living in households with a separate kitchen were less likely to have active TB as was also found in India.\textsuperscript{16}

This study showed household contact as an important risk factor for tuberculosis which is consistent with the findings of some previous studies in West Africa and Lao People’s Democratic Republic where family history of TB was two to three times more frequent among childhood TB cases compared to the controls.\textsuperscript{12,19-21} Presence of BCG scar was higher among controls than among the cases. It was suggested that when given to children at an early age BCG provides about 75% protection for 15 years.\textsuperscript{22}

Childhood TB usually has nonspecific clinical signs, variable chest X-ray features; and infection is paucibacillary in nature with low bacteriological confirmation rates. Diagnosis of tuberculosis in children is relied mainly on clinical case-definition; tuberculin skin testing and chest radiography.\textsuperscript{23,24} In this study, cases and controls were selected on the basis of sputum microscopy, a highly specific test with low sensitivity, which might have resulted in increased volume of false negatives among controls. Children who had smear-negative pulmonary TB or were unable to produce adequate sputum samples (as expected in young children) and or children who had extra-pulmonary tuberculosis might have a chance to be misclassified as controls. So risk factors found to be associated with childhood TB in this study would be more valid for smear-positive tuberculosis cases.

As it was a case control study, there was a potential for recall bias. The controls were reluctant to provide information regarding frequency and duration of the exposure as well as contact history. As the controls were also taken from the DOTS microscopy center register, they were seemingly more health conscious or may have had easy access to the centre and thus might not be representative.

To conclude, improvement in the living standard of children (education and housing condition etc.) will help in reducing childhood TB in the community. The tuberculosis prevention programme in Bangladesh mostly focuses on detecting and treating index cases. Contact tracing and contact screening should also be incorporated as part of the National TB Control Programme for early diagnosis and treatment.

References


Responding to measles outbreak: closing the immunity gap in children of Timor-Leste

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**Background:** An outbreak of measles was reported in Timor-Leste during 2011. A concerted response at national level utilized this opportunity to improve measles immunization coverage rates.

**Methods:** Health Management Information System and Surveillance System data were utilized to describe the outbreak. Attack rates and case fatality rates (CFR) were calculated using standard methods. Evaluation surveys were used to access immunization coverage. Proceedings of weekly meetings of the National Committee for Control of Disease Outbreaks were reviewed.

**Results:** A total of 739 cases and 8 deaths were reported to the Surveillance Unit. Most (>82%) of the measles cases were reported from Dili and Ermera districts. The attack rate was 1.3 per 1000 population and CFR was 1.1%. The response was coordinated by the National Committee for Control of Disease Outbreaks, which included case management, active and passive surveillance, communication and measles immunization among six-month to 14-year old children. Immunization activity targeted 495 000 children, i.e. almost one-half of the Timor-Leste population and achieved high coverage (85%).

**Conclusions:** The outbreak highlighted gaps in the immunity against measles. The National Committee for Control of Disease Outbreaks ensured a coordinated response which led to prevention of deaths from measles due to early case management with vitamin A supplementation, and high measles immunization coverage.

**Key words:** Measles, outbreak, immunization, surveillance, Timor-Leste.

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**Introduction**

In May 2010, the World Health Assembly endorsed a new measles mortality reduction goal.\textsuperscript{1} A South-East Asia Regional Consultation in 2009, agreed that measles elimination was technically, biologically and programmatically feasible. In 2010, the sixty-third session of the Regional Committee adopted the regional interim goals towards measles elimination as approved by the sixty-third World Health Assembly. The interim goals to

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be achieved by 2015 are: (a) Exceed 90% coverage with the first dose of measles-containing vaccine nationally, and exceed 80% vaccination coverage in every district or equivalent administrative unit; (b) Reduce annual measles incidence to less than five cases per million and maintain that level; and (c) Reduce measles mortality by 95% or more in comparison with 2000 estimates.

According to global estimates, 36,000 measles deaths occurred in the countries of WHO’s South-East Asia Region in 2007. In 2009, a total of 469 outbreaks of suspected measles were reported with measles incidence ranging from 0.10 per 100,000 population in Sri Lanka to 9.57 per 100,000 population in Thailand. Immunization coverage rates were variable, ranging from 98% in Bhutan, DPR Korea, Maldives and Thailand to 70% in Timor-Leste. However, to achieve measles elimination, all countries in the WHO South-East Asia Region are providing second dose of measles vaccine through routine immunization programmes or through Measles Supplementary Immunization Activity (SIA).³

In Timor-Leste, the first measles SIA activity was done in 2003 targeting 9-59-month-old children. Another SIA was done for the Internally Displaced Population in 2006, for children six months to 14 years of age. Again, in June 2009, measles vaccine was offered to all children in the country in the age group of 6-59 months, as part of the national tetanus toxoid campaign.³ The Demographic Health Survey (DHS) shows that only 53% of children were fully immunized in 2009-2010.⁴ As shown in Figure 1, routine immunization coverage for measles appears to have leveled off at 55% to 67% over the past several years.

**Figure 1: Suspected measles cases, supplementary immunization activity (SIA), and reported measles immunization coverage (MCV1), Timor-Leste, 2002-2010**

![Figure 1](image-url)

Source: South-East Asia Region Measles and Rubella Factsheet. World Health Organization, 2010¹
The surveillance system in Timor-Leste largely depends on cases reported by health facilities. In the last few years cases of measles had been reported (Figure 1), but considering the low utilization of health services, data only from health facilities may underestimate the actual incidence of measles cases and deaths. The impediments of distance, cost and poor infrastructure along with low levels of awareness contribute to poor access to government health services. Outbreak investigation revealed the existence of a large immunity gap of measles in 2011. This report presents characteristics of the outbreak and the concerted response that led to the bridging of the measles immunity gap in Timor-Leste.

Methods
Measles cases were detected by both active and passive surveillance. During the period of the outbreak all health facilities were required to submit daily reports to the Health Management Information System (HMIS) and Surveillance Unit at the Ministry of Health including a nil report if cases did not occur. Cases reporting to the health system were then followed up at home with a house-to-house search for more cases in the immediate vicinity of the household with the measles case. Cases were identified based on the “Standard Case Definition for Measles”. A few cases were also subjected to measles serology testing (Ig M antibody) by the National Laboratory, to confirm the diagnosis of measles.

The Surveillance Unit was responsible for providing updates during the weekly meetings of the National Committee for Control of Disease Outbreaks. The Surveillance Unit also conducted a special investigation in Laclo village of Ermera District, which recorded a large number of cases, to enquire about the immunization status of children. The proceedings of the Committee meetings, which recorded the discussions and decisions, were reviewed. In addition, the outbreak reports prepared by the Surveillance Unit, the EPI unit, UN agencies and other partners were also analyzed. A line list of cases was prepared using WHO case definition. Attack rates and case fatality ratio (CFR) were calculated using the WHO SEARO Measles and Rubella Surveillance and Outbreak Investigation Guidelines, 2009. Outbreak data were analyzed by using SPSS version 14.0 for Windows. The reports of the measles immunization catch-up activity were also analyzed using Epi Info software version 3.5.3. An independent coverage evaluation survey (CES) commissioned by the Ministry of Health in partnership with UNICEF and WHO using the standard WHO 30-cluster method for immunization cluster survey assessed the coverage of measles vaccine after the supplementary measles immunization activity. Differences in proportions/rates were compared using the chi-square test. Statistical significance level was set at $p <0.05$.

Results
The measles outbreak
Measles cases started occurring in early February 2011, reached its peak in April to May 2011, and a decline began after 15 May 2011. The progression of the outbreak over time is depicted by the epidemic curve, representing the weekly frequency of cases reported (Figure 2). Of the first 18 suspected measles cases, 15 cases were confirmed to be measles by laboratory tests.

The outbreak affected 12 out of 13 districts of Timor-Leste (Figure 3). A total of 739 measles cases and eight deaths were reported to the Surveillance Unit of the Ministry of Health. More than 82% of measles cases were reported by two districts - Dili (343 cases) and Ermera (264 cases). The age distribution of
Figure 2: Epidemic curve of measles outbreak, Timor-Leste, February – July 2011

Figure 3: Geographic distribution of measles cases during 2011 outbreak in Timor-Leste
The measles cases ranged from 1 month to 25 years. Most (90%) of the cases were between 6 month to 14 years of age (Figure 4). The percentage of male cases (52%) was slightly higher than females.

The special investigation carried out by the Surveillance Unit in Laclo village, Ermera district found significant difference (p <0.05) in the attack rates between vaccinated and unvaccinated children in age groups of 1 to 4 years. The vaccine effectiveness among children 1–4 years and 5-14 years was 68% and 42% respectively. The data on history of measles immunization was collected by trained investigators, who visited the households with cases and then conducted a door-to-door search for cases in the neighbouring households. Only the data of children whose vaccination status was known were used in calculating the vaccine effectiveness.

Nationally, the attack rate was 1.3 per 1000 population. The highest attack rate was in Ermera district (3.1 per 1000 population). The difference in attack rate in < 1 year (2.5), 1 to 4 year (2.8), and 5 to 14 year (2.7) age groups was not statistically significant. There was no significant difference in the attack rates between males and females also. The case fatality ratio was 1.1%. Measles-related deaths were reported by Ermera (three deaths, CFR 0.9%) and Dili district (five deaths, CFR 1.9%). All measles-related deaths were due to pneumonia.

**Response to the outbreak**

A concerted response was launched involving officials of the Ministry of Health at national and district levels along with UNICEF, WHO and nongovernmental organizations (NGOs) which was essentially coordinated by the
National Committee for Control of Disease Outbreaks (Komisaun Nacional Kontrola Moras Surtu) chaired by the Health Minister. It has representatives from various health departments and agencies like WHO, UNICEF and NGOs. The committee implemented its tasks through six sub-committees - Surveillance, Medical Management, Laboratory, Environmental Health, Logistics/Medical Supplies, Media and Communications. During the outbreak, the committee met once every week to review the situation and to decide the line of action.

The measles outbreak response plan basically included surveillance, case management, communication and measles immunization. Both active and passive surveillance methods were used to identify cases of measles. Health care providers were oriented on the standard case management of measles and administration of vitamin A supplementation. In addition, the health facilities were equipped with the required drugs and supplies. In areas with high case load, like Atsabe sub-district in Ermera, a special team equipped with an ambulance and essential supplies provided support to the Community Health Centre staff. Communication activities used mass media such as television, community radio, public and church announcements.

Measles immunization catch-up activity was undertaken after a detailed plan in a phased manner. It included measles immunization to all children in the age group six months to 14 years, vitamin A (100 000 IU) for children from six months to one year, vitamin A (200 000 IU) and de-worming for children from one year to four years. This activity was carried out over three weeks, with the first week dedicated to immunization in schools and the second and third weeks dedicated to immunization in outreach sites. Daily sessions were also conducted in the health facilities.

The immunization catch-up activity was preceded by a nationwide micro-planning exercise. The Ministry of Health coordinated the involvement of a number of partners who supported a wide range of activities – from providing additional vaccinators and mobilizing communities for immunization to helping transport health workers to be able to immunize children in remote areas. Operational guidelines and briefing materials were prepared. The doctors at the health facilities and medical students received training in the recognition and clinical handling of Adverse Events Following Immunization. Communication materials were developed, translated into Tetum, and distributed to health workers, local leaders and other community influencers. The coverage evaluation survey revealed coverage of 85% (95%CI: 81.1%-88.9%) for the measles catch-up activity, while the reported coverage (HMIS reports) was 92% (Figure 5).

Discussion

The delivery of immunization services in Timor-Leste is challenged by populations living sparsely in mountainous terrain with poor infrastructure coupled with human resource shortages. The capital Dili and certain other districts had significant numbers of unimmunized children, potentially posing a huge risk for measles outbreaks. The Measles Strategic Plan (MSP) tool after considering the existing immunization coverage and the measles supplementary immunization activities in the past, had demonstrated a large pool of children unprotected against measles in 2010 (this, however, does not include the children protected by natural infection with measles virus).8

Similar outbreaks, following low levels of immunization coverage and the consequent existence of a large susceptible pool of...
unprotected children have been documented in other settings.9,10 The low case fatality rate (1.1%) could be attributed to the immediate response implementing the case management protocols including vitamin A supplementation. The higher CFR of 1.9% in the capital Dili, the largest urban area of Timor-Leste, is a cause of concern. The Demographic Health Survey 2010 also showed that though about seven in ten children with Acute Respiratory Infection symptoms were taken for treatment, only 45% were treated with antibiotics. The Ministry of Health has been actively pursuing the implementation of SISCa or Servico Integrado Saude Communitaria, which is an innovation to make health services more accessible to communities to improve health-seeking behaviour.11

The poor vaccine effectiveness is a cause of concern. However, the values need to be viewed with caution due to the small sample and wide confidence intervals. Moreover, since only the data from children whose vaccination status was known, were used in calculating the vaccine effectiveness, it may have possibly resulted in misclassification as many caretakers who did not know the status of vaccination are likely to have not vaccinated their child. This may have resulted in calculation of lower than expected attack rates in the unvaccinated group and consequently calculation of lower vaccine effectiveness than expected. Low levels of vaccine effectiveness have also been recorded from other developing countries, where cold chain and other programme failures have shown to adversely impact the effectiveness of measles vaccine.12,13

The measles immunization catch-up campaign launched in response to the outbreak, reported a national coverage of 92% in the age group of six months to 14 years. After the completion of campaign activities, an independent coverage evaluation survey (CES) commissioned by the Ministry of Health in partnership with UNICEF and WHO using the standard WHO 30-cluster method for
immunization cluster survey, arrived at a lower coverage (85%). A comparison between the reported and evaluated coverage (Figure 5) revealed that the largest discrepancy was in the age group of 6-11 months. This could be largely attributed to the errors in reporting of the numerator or denominator data in this age group.

The outbreak response also resulted in a few spin offs and important learning. The guidance provided by the National Committee for Control of Disease Outbreaks was vital in ensuring a coordinated response that led to prevention of deaths from measles due to early initiation of case management with vitamin A and higher coverage of the countrywide immunization response. This committee has been further strengthened and has become a regular forum for information sharing. It has played a vital role in controlling outbreaks of dengue and acute diarrhoeal disease in the recent past. The oversight and feedback provided by the committee has also helped in improving the quality of the surveillance and HMIS data.

The lessons learned have been utilized while developing a Measles Mortality Reduction Strategy and action plan. Based on modeling estimates, the plan advocates for providing a second opportunity for measles immunization through SIA in 2011 and 2014, moving from outbreak-based surveillance to case-based surveillance, achieving and maintaining high coverage for routine measles immunization, ensuring proper case management with vitamin A supplementation, and strengthening laboratory capacity for timely collection of specimens, diagnosis and feedback. On achievement of greater than 90% coverage of routine measles immunization in all districts, the plan calls for introduction of MCV2 (second opportunity with measles virus containing vaccine) in routine EPI programme from 2015 onwards. The experience from the outbreak also indicates that the main pillar for the movement towards measles elimination remains a strengthened Routine Immunization System. The Ministry of Health in its recent Country Multi-Year Plan for Routine Immunization has identified its priorities as addressing the bottlenecks for routine immunization and sustaining high routine vaccination coverage, addressing the funding gap, vaccinating the hard-to-reach population and improving micro plans and systems of supportive supervision and community mobilization.

To conclude, the outbreak of measles in Timor-Leste was a result of low coverage with routine immunization and the subsequent buildup of a large pool of children unprotected against measles. A comprehensive response, which included appropriate case management and vitamin A supplementation under the aegis of the National Committee for Control of Disease Outbreaks was responsible for the low case fatality rates. The lessons learned in the outbreak indicate that the government of Timor-Leste, and partners should work jointly to put in place a comprehensive measles mortality reduction strategy and invest in strengthening routine immunization systems. Operational research could help in understanding the bottlenecks like poor geographic access and low demand for routine immunization services. High coverage achieved in the measles immunization catch-up campaign, along with sustained high rates of routine Immunization coverage would help in closing the immunity gap for measles in Timorese children.

Acknowledgements

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from all the national and international NGOs and partner agencies for the Measles Immunization Catch-up Activity.

References


Decentralization of health services in India: barriers and facilitating factors

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**Background:** In India, the process of decentralization of health services started taking shape in the mid-1990s. Systemic reforms envisaged delegation of administrative and financial responsibilities at district level for management of health-care institutions in 23 states of India in 1999. Subsequently, some of these reforms became part of the National Rural Health Mission (NRHM) launched in 2005. This study aims to document the process of decentralization in health services with special reference to the barriers and facilitating factors encountered during formulation and implementation of reform policies.

**Methods:** Secondary data were reviewed, health facilities were observed, and semi-structured interviews of the key actors involved in decentralization were carried out in Haryana (India).

**Results:** Political and bureaucratic commitment to reforms was found to be the most important facilitating factor. Orientation training on decentralized administrative structures and performance-based resource distribution were the other important facilitators. Structural changes in administrative procedures led to improvement in the financial management system. Significant improvement in the public health infrastructure was observed. From 2004 to 2008, the state government increased the budget of health sector by nearly 60%. Frequent changes in the top administration at the state level hampered the decentralization process. Districts having a dynamic administrative leadership implemented decentralization more effectively than the rest.

**Conclusions:** Decentralization of financial resources has improved the functioning of health services to some extent. Major policy decisions on decentralization of human resource management, increase in financial allocation, and greater involvement of community in decision-making are required.

**Key words:** Health services, policy, programme, qualitative, decentralization, management.

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**Introduction**

India is a vast country having the second largest population in the world. It comprises of 28 states and 7 union territories.\textsuperscript{1} Though decentralization of finances and functions started way back in the 19th century,\textsuperscript{2} it was the 73\textsuperscript{rd} Amendment to the Constitution of India (1992) that brought decentralization to the forefront.

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In India, health services are organized and financed by state governments as the Constitution of India affirms health as a state subject. Few subjects such as international health and epidemic control, etc. are dealt with by the Government of India. Hence, several national health and family welfare programmes are planned and financed by the Central Government but are implemented by the state governments.

Centralized planning and operational controls had been a major area of concern in India as it had led to poor demand and inadequate supply of health services. Most patients consult private practitioners rather than government health services. Therefore, National Population Policy (2000) and Health Policy (2002) emphasized the importance of decentralization. The process of decentralization started taking shape with the National Reproductive and Child Health Programme after the International Conference on Population Development. However, a sector-wide approach was adopted only in the late 1990s when 23 state governments initiated the Health Sector Investment Programme. Health service reform envisaged decentralization of administrative and financial functions from the central/state level to the district/subdistrict level and also to the peripheral health institution level.

We have studied the process of decentralization in health services with the focus on understanding the barriers and facilitating factors in Haryana state. Haryana, located in northern India, had a population of 21 million in 2001. The per capita gross domestic product in this state is one of the highest in India. However, health indicators place this state in the middle range of performance. The governance systems in Haryana state are similar to many other states of India, i.e. elected legislative bodies and executive structures exist at state, district, subdivision, city/town and village level respectively.

**Health service reforms**

Brainstorming workshops were held during 1999 to identify the problems and solutions. All stakeholders, i.e. state-and district-level senior government officers from general administration, health service, rural development, social welfare, education department and non-governmental organizations participated in these workshops. Based on the recommendations, State Action Plans were conceived. These plans were discussed at the State Health Sector Reform Cell, which was created to review the progress and to troubleshoot any emerging problem. District Action Plans were prepared following the participatory planning approach. In these plans, *panchayati raj institutions* (a three-tier structure of elected bodies at village, subdivision and district level) were to be made responsible for the functioning of most peripheral health institutions, i.e. subhealth centres in rural areas. This initiative has been documented as one of the best practices in the Policy Reform Database. The Haryana State Sector Reform Cell recommended several policy initiatives (Box 1).

The administrative and financial powers of district and subdistrict health authorities of health department were revised in the year 2000. Learning from experiences of three pilot districts where reforms were initiated in 1999, state government started making concerted efforts to direct the decentralization and devolution process throughout the state in 2003. Several “societies” that were established earlier for various centrally-sponsored national health programmes were merged into one District Health Society. The exercise of capacity building of staff on decentralization was completed in all districts of the state by 2005.
Box 1: Policy reforms recommended by the Haryana State Sector Reform Cell

- Setting up of district health and family welfare agencies (societies) in all districts and at the state level.
- Restructuring of the State Directorate of Health and Family Welfare.
- Decentralization of financial and administrative powers.
- Training of staff of panchayati raj institutions for their effective involvement in management of health facilities.
- Introduction of Public-Private Partnership mechanisms for effective service delivery.
- Workforce management including the mainstreaming of medical and para-medical staff of the Indian Systems of Medicine.
- Making public health training an essential requirement for Chief Medical Officers.
- Adopting a transparent and decentralized staff recruitment, promotion and transfer policy.
- Restructuring of staff cadre and creation of a specialist cadre for doctors.
- Developing and adopting a training policy.
- Reviewing and redefining the job descriptions of various categories of staff.
- Rational use of infrastructure by resource mapping and defining various types/levels of health institutions available in the public sector.
- Improving the quality of hospital services and adopting an autonomy package for hospitals.

Newly created health societies* at the state and district levels adopted a performance-linked financing model. Persons were nominated for membership of such societies from a wide range of health and related sectors and institutions, i.e. from government and nongovernmental organizations and professional associations. Health societies were registered under an existing law7 that permitted them to have their own constitution, governance structure, rules and regulations. The chairmen of governing councils of societies were generally the chief administrative officers from the general administrative service of the government, while the chairman of executive council of the society was head of the government health service unit at state or district level. The conventional line administration of health services (Director, Health Services - Chief Medical Officer- Senior Medical Officer- Medical Officers) also continued to be the primary vehicle for implementation of action plans designed by health societies at state and district levels. The commitment of the State Health Secretary and Director, Health Services led to the strengthening of “health societies” through installation of modern computing systems and appointment of additional secretarial and technical staff for “societies”.

Training of medical officers on decentralization and government orders on retaining and utilizing the “user fee” encouraged

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* Under the Indian Law, a group of individuals can form organizations, generally termed as a society or trust with its own Constitution, Governing Board, Executive Committees, and rules and regulations to carry out non-profit welfare programmes.
utilization of funds that were being transferred by the Government of India to district health societies. Training of district staff involved in account-keeping within the society structure further facilitated fund utilization.

To enhance accountability, a Memorandum of Understanding (MoU) between the Government of India and state governments, and the European Delegation was prepared in 2002, which was signed in August 2003. The MoU dealt with an agreed upon reform programme, spending plan and milestones, state action plans and district action plans, the major emphasis being on policy changes and on performance-linked financing. The National Rural Health Mission (NRHM) launched by Government of India in 2005 further strengthened the decentralization structures and local-level planning.

Methods

An historical method was used for mapping the policy-to-practice timelines. The agenda and proceedings of the State Reform Advisory Committee and State Health and Family Welfare Sector Reform Cell meetings were reviewed systematically. Besides government documents, newspaper commentaries pertaining to decentralization policies and programmes were also reviewed. The observations made by an evaluation consultant and presentations made by state health service staff, at various public forums and administrative review meetings held during 2003 to 2007, were used to strengthen the information base.

Routine data from state health information system was obtained for assessment of changes in health service utilization. Quasi-participant observations were made by two investigators for understanding the process of decision-making at various administrative levels, i.e. at state, district and health institution level in the Haryana state.

The District Health Society was evaluated in a pilot district by interviewing its chairman and two members of the governing board/executive council; one of them was a local community leader and the other was representing a professional organization of doctors. Semi-

Table 1: Timeline for decentralization of Haryana State Health Services

<table>
<thead>
<tr>
<th>Actions</th>
<th>Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>State Committee on Voluntary Action (SCOVA)</td>
<td>1997</td>
</tr>
<tr>
<td>Societies for each of the national health programmes at district level</td>
<td>1997</td>
</tr>
<tr>
<td>Delegation of financial and administrative powers</td>
<td>1997</td>
</tr>
<tr>
<td>District societies revived, merged and made functional in three pilot districts</td>
<td>2001</td>
</tr>
<tr>
<td>Health societies formed in three pilot districts</td>
<td>2001</td>
</tr>
<tr>
<td>Health societies at state level and in all districts</td>
<td>2004</td>
</tr>
<tr>
<td>Health societies in all health institutions</td>
<td>2004</td>
</tr>
<tr>
<td>Operationalization of “user fee”</td>
<td>2005</td>
</tr>
<tr>
<td>State Health Missions constituted</td>
<td>2005</td>
</tr>
<tr>
<td>District Health Missions constituted</td>
<td>2006</td>
</tr>
<tr>
<td>Health societies constituted at state, district and block level</td>
<td>2006</td>
</tr>
<tr>
<td>Health societies operationalized for most national health programmes</td>
<td>2007</td>
</tr>
</tbody>
</table>
structured pre-tested interview schedules were used for conducting interviews. The level of community participation, i.e. involvement of community leaders in decision-making, was assessed by their attendance at meetings of district health society and the extent of information sharing between the members of the district health society’s governing board/executive council and the general community. The effectiveness of health institution-level committees named swasthya kalyan samiti (health welfare societies), in implementing reforms, generating resources and improving the quality of services by utilizing revenue collected locally, was ascertained by interviewing the chairperson and two randomly selected members of these societies who represented nongovernmental organizations and panchayti raj institutions (elected bodies in the rural areas).

We used the theoretical framework of policy analysis proposed by Gill Walt and the “decision space” framework suggested by Bossert et al. The Gill Walt theoretical framework of policy analysis relates to the role played by different players, while the “decision space” model has been used to identify the range of choices for performing the functions decentralized by the centre/state to the district and health institution level.

**Results**

The policy changes for decentralization resulted in enhancing discretion or creation of “decision space” for the district and sub-district level administrators of Healthcare Institutions/Organizations through the creation of semi-government bodies, i.e. ‘Health Societies’.

The implementation of state action plans and district action plans was quite slow during 2001-2002. Only about 26% of the allocated financial grant was spent in Haryana. The implementation status was similar across all 23 states of India. A change in the top administration of Haryana State in 2003 led to changes in the action plan despite the existence of a signed MoU.

**Facilitating factors**

The review of minutes of governing body meetings at district level revealed that the major reason for better performance was active involvement and leadership of the Deputy Commissioner (top district bureaucrat) in the “health society” as its Chairman. He/she introduced regular programme review meetings that led to strengthening of intersectoral coordination, especially regarding the repair and maintenance of buildings by other government departments. Financial grants had been released to “societies” as per their need to carry out repair and maintenance of buildings. These grants were found to have been utilized to a large extent.

In most states, decentralization led to a visible improvement in the physical condition of hospital/health centre buildings especially in district hospitals. Health service providers reported improvements in the range and quality of services due to provision of adequate equipment in operation theatre, construction of new operation theatres and new maternity wards (6-bed and 12-bed wards in subdistrict hospitals), provision of clean linen, blankets and furniture for patients, provision of continuous supply of laboratory reagents and chemicals at all levels of health-care institutions, minor repairs of buildings, purchase of electricity generators and batteries to maintain continuous electricity supply and improvement in the cleanliness of health institutions. These changes improved the visibility and look of health-care institutions.
### Table 2: “Decision space” for delegated powers in Yamuna Nagar District of Haryana State, India

<table>
<thead>
<tr>
<th>Function</th>
<th>Range of choice</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Administrative</strong></td>
<td></td>
</tr>
<tr>
<td>Contract appointment of staff</td>
<td>- Narrow choice for recruitment of specialist doctors/paramedics</td>
</tr>
<tr>
<td>Transfer of staff</td>
<td>- Moderate choice for recruitment of health workers</td>
</tr>
<tr>
<td>Contracting services</td>
<td>- Wide choice for recruitment of lowest category staff</td>
</tr>
<tr>
<td>Implementing innovations</td>
<td>- Narrow choice for short-term posting only</td>
</tr>
<tr>
<td></td>
<td>- No exercise of power for contracting services</td>
</tr>
<tr>
<td></td>
<td>- Wide choice for implementing innovations</td>
</tr>
<tr>
<td><strong>Financial</strong></td>
<td></td>
</tr>
<tr>
<td>Generation of money</td>
<td>- Wide choice for accepting donations, leasing shop/land/canteen</td>
</tr>
<tr>
<td>Spending money</td>
<td>- Power to spend up to Rs 100 000 for Chief Medical Officer and from Rs 100 000 to 500 000 with approval of Chairman of District Health Society Governing Body</td>
</tr>
<tr>
<td>Meeting stock shortages through “user charge”</td>
<td>- Wide choice for procuring laboratory reagents and chemicals</td>
</tr>
<tr>
<td></td>
<td>- Moderate choice for other non-consumables</td>
</tr>
<tr>
<td></td>
<td>- Narrow choice for maintaining supply of medicines.</td>
</tr>
<tr>
<td><strong>Human resources</strong></td>
<td></td>
</tr>
<tr>
<td>Salaries</td>
<td>- Narrow choice delegated as majority was controlled at Central/State level</td>
</tr>
<tr>
<td>Problem of absenteeism</td>
<td>- Narrow choice for taking administrative action for tackling absenteeism etc., which was limited to contract staff</td>
</tr>
<tr>
<td></td>
<td>- Narrow choice as entirely controlled at Central/State level</td>
</tr>
<tr>
<td></td>
<td>- Choice limited to contract staff</td>
</tr>
<tr>
<td><strong>Community participation</strong></td>
<td>- Narrow choice and little community needs assessment</td>
</tr>
<tr>
<td></td>
<td>- Little community needs assessment</td>
</tr>
</tbody>
</table>

Powers to spend the money were also significantly increased at Health Centres from Rs 5000 to 10 000.
The outpatient attendance increased by 35% even in remote districts. The rate of child births in government health facilities started going up in 2004; it increased by 20% by 2006. Based on the encouraging performance of the health sector, the state government increased its annual budget for the year 2005-2006 by 60%, i.e. from 450 to 750 million Indian rupees.

Delegation of powers related to human resource management such as the placement policy for ensuring availability of specialist medical and surgical services at first-level referral units, policy on essential drugs list and generic medicines, and standard treatment guidelines improved the utilization of outpatient and inpatient services during 2004-2005. All stakeholders at the district and health institution level reported that the financial resources available to health societies and the administrative and financial powers delegated to them were sufficient. It was felt that a trained accountant was needed since administrators at subdistrict level had difficulty in handling the accounts. Medical officers at health centres suggested that a system of internal audit should be set up for ensuring procedural correctness of financial transactions at institution level. This would make the Chairman of the “Health Society” more confident.

The National Rural Health Mission (NRHM) launched by the Government of India in 2005 further strengthened decentralization structures and initiated local-level planning. The management units of “health societies” at state and district levels were strengthened with financial support from the NRHM. Introduction of a financial management manual, training of all concerned on financial management, and placement of a Chartered Accountant strengthened the decentralization process as it increased the use of delegated powers.

**Barriers**

However, many of the initiatives such as computerization of the management information system related to drugs could not be sustained. Interviews with stakeholders revealed that although the power of appointing staff on contract and disbursement of their salaries was vested with the Chairman of district health societies, except for the appointment of the lowest category of staff, no other category of staff could be appointed as state government rules permitted appointments of staff only through a private agency/nongovernmental organization intermediary. These agencies were not available in districts. Hence, despite the severe shortage, specialist doctors, general duty doctors and accountants could not be recruited.

### Table 3: Haryana health service decentralization: facilitating factors and barriers

<table>
<thead>
<tr>
<th>Facilitating factors</th>
<th>Barriers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Commitment at all levels</td>
<td>Lack of advocacy at higher levels</td>
</tr>
<tr>
<td>Financial support</td>
<td>Frequent transfers of key officials</td>
</tr>
<tr>
<td>Technical support</td>
<td>Person-driven, not system-driven</td>
</tr>
<tr>
<td>Performance-based funding</td>
<td>Departmental administrative structures</td>
</tr>
<tr>
<td>Cultural and social environment</td>
<td>Management capacity of health professionals</td>
</tr>
<tr>
<td>Review meetings by health secretaries</td>
<td>Lack of capacity to utilize funds</td>
</tr>
<tr>
<td>Flexibility in utilization of funds</td>
<td>Lack of human resources</td>
</tr>
</tbody>
</table>
The decentralized “society” structures could involve *panchayati raj institutions* in their governing councils but could not make them responsible for managing the functioning of sub-health centres. However, decentralization provided implementers at the district an opportunity to innovate. District health societies could initiate public-private partnerships to extend services to the urban poor.

Lack of sufficient financial flexibility in recruiting medical officers and specialist doctors was cited as a problem because the level of salary specified by the government for contracting out doctors was much less than the prevailing market rates. Another difficulty encountered by the “societies” at health institution level was their inability to purchase routine drugs since government rules permitted purchase of only emergency drugs. Shortage of drug supply at health centres remained an unresolved issue.

The period from late 2004 and early 2005 was of political and bureaucratic change at the top in most states. It became increasingly difficult to sustain the changes that had been made in the immediate past. At one of the meetings it was discussed that all reforms should be reversed. The situation stabilized by late 2005. An amendment was made to the State Treasury Rules in 2007 for direct appropriation of “user fee” at institutional level by “health societies”.

### Discussion

**Issues related to the dichotomy of administrative roles and financial resources between the Centre and the states are well recognized in India.** Until 1994, the Ministry of Health and Family Welfare, Government of India had a major role in decision-making related to the National Family Welfare and Disease Control Programmes especially in setting targets. Funds transfer from the Centre to the state treasury often resulted in delay and or diversion of resources to other pressing needs. Hence, the Central Government required that states should register a “society” named the State Committee on Voluntary Action (SCOVA) in 1997 for receiving Central Government grants. The administrative and financial powers devolved upon SCOVA could not be used as there was resistance to change; implementation plans could not be prepared and funds were poorly managed. The creation of “health society” structure and linking the transfer of funds to state and district health societies with action plans ensured that the funds meant for implementation of action plans were utilized only for health programmes. Various innovations/best practices emerged as states had the power and resources to do so during the transition phase from centralization to decentralization.

Gill Walt (1994) emphasized the role of actors and the context in policy change. The change process required decentralization that took shape only when the technical consultant advocated the need for a policy on decentralization to the State Health Secretary and Director-General of Health Services and district health officers. It was a tough task as delegation of powers called for “shared” responsibility at all levels. However, as most states were facing financial pressure during the 1990s, reforms in the hour of crisis provided an opportunity for “defining priorities, refining the policies, and reforming the institutions through which policies are implemented”. Therefore, the state government signed an MoU to augment the fund flow for which the state was required to have a decentralized structure – “health societies” for planning and monitoring the health programmes.
The implementation of decentralization had a principal-agent relationship between the European Commission (principal) and the Government of India (agent). A similar relationship existed between the Government of India and the state government on the one hand and between the state government and district health administration on the other hand. District action plans were a kind of MoU between the state and districts, which defined the relationship among these agencies. Performance-based funding between the Government of India and the state on accomplishment of certain reforms and expenditure targets was the major catalyst of change. Similarly, the District Action Plan embodied “a relational contract” and not a “hard contract”, which decided how and in what direction the agent, i.e. district health societies will move. The bureaucratic and political interests of retaining the powers conferred on them have acted pervasively against the interests of the principals, as is reflected by the comment made by one of the top bureaucrats on decentralization plans: “Oh, now I understand that you want to bring the government down to the district level!”

Performance-based funding can be an incentive to service providers but it needs to be viewed in the larger context of health reform, i.e. equity, efficiency, quality and financial soundness.\(^6,13\) It needs to be designed as a political reform to increase the local autonomy and reduce the extent of federal control.\(^14\) Decentralization may not envisage improvement in health services but may bring changes in the authority and financial responsibility for health services. This case study of Haryana state shows that despite the pressure of performance-linked funding all districts did not perform equally. The ownership and financial management capacity of local agencies have been questioned across the globe including East Asian countries like China, Indonesia, the Philippines, Thailand and Viet Nam.\(^15\)

It has been argued that free health services encourage inefficient overuse of allocations. And “user charges” may exclude the poor from availing health care. Reforms in India have exempted poor patients (living below the poverty line) from “user charges”. Physicians and medical superintendents/senior medical officers could exempt the poor patients from “user charge” by not insisting on their possessing a documentary proof of poverty. They could use their judgement to decide who should pay “user charge”.

Though health reforms did envisage making health institutions “autonomous”, but their ownership was not transferred to the newly-created institutional bodies, i.e. health societies. Local elected bodies (panchayati raj institutions or municipal committees) were also not fully involved in their planning and monitoring in most states. Only the states of Kerala, Gujarat and Maharashtra were able to involve locally elected bodies in planning. These bodies were also empowered financially to some extent. Decentralization in Indonesia was more radical where over 16 000 public service facilities were handed over to regions, and a brand new inter-governmental fiscal system was put in place.\(^16\)

To realize the full potential of decentralization, the “resistance” in sharing power and resources (on the part of state-level politicians and bureaucrats) with the district-and subdistrict-level politicians and administrators needs to be addressed. There is reluctance or lack of political will in district and subdistrict-level governing bodies to take over or manage health institutions because of their inadequate capacity/experience. Capability building of local bodies is required; otherwise the decentralization efforts in respect of health services may get reversed soon.
Health services in India need greater decentralized planning, and better managerial and monitoring systems. Financing of decentralized health services should be the responsibility of the Central and state governments as most of the revenue generated through tax is at these levels. The local government at city, village, subdistrict or district level does not have an adequate financial resource base. The technical aspects of service delivery may be the responsibility of health professionals but the planning, organizing, budgeting and monitoring functions should rest with the elected representatives of the local government at district level who can have technical support from health societies. Technical guidelines and policies could be formulated at the Central or state level for maintaining technical standards. More research using a mix of methods (quantitative and qualitative) involving the end users of health services is also required for monitoring the effects of decentralization as State-sponsored policies and interventions may not be more effective in promoting development.17

Though members of “health societies” were largely nominated from among the stakeholders to encourage intersectoral coordination, their nominations were generally driven by general administrators in consultation with health administrators. The governing bodies at local level, i.e. municipal committees in urban areas and panchayati raj institutions in villages, members of which are elected by people, did not have a decisive role in the working of a “health society”. Health societies require a strong secretariat supported by professional managers, accountants and auditors, etc. It is essential to address the constraints in institutionalizing locally elected bodies through both macro and micro structural changes.18 Decentralization can lead to cost-effective, humane and accountable health service only with political commitment, legislative framework, financial decentralization and resource mobilization, management capacity and community participation.19 A more thoughtful groundwork for decentralization is necessary before a broadened participation and empowerment of community can be attained. Translating the policy of decentralization into action may be more successful through the action research mode.14

To conclude, decentralization has improved the functioning of health services to some extent in India. Political and bureaucratic commitment to reforms was found to be the most important facilitating factor. Orientation training and performance-based resource distribution were the other important facilitators. Structural changes led to improvement in the financial management system. Also, significant improvements in the public health infrastructure have been observed. Frequent changes in the top administration at the state level hampered the decentralization process. Districts having a dynamic administrative leadership implemented decentralization more effectively than the rest. Major policy decisions covering decentralization of human resource management, increase in financial allocation and greater involvement of the community in decision making need to be taken. At present only about 1.1% of GDP is spent on health by the Central and state governments,20 large number of vacant positions exist in various health institutions,21 and decision-making still happens mostly at Central and state government level. There is no quick recipe to decentralization but a visionary political leadership, in combination with a strategic focus of bureaucrats working in the public health system having good technical capacities, is needed so that the technical, social, cultural, professional and political aspects of decentralization are managed properly.
Decentralization of health services in India

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Oral fluid therapy of cholera among Bangladesh refugees

D Mahalanabis, AB Choudhuri, NG Bagchi, AK Bhattacharya & TW Simpson

Introduction
A crucial field trial of oral electrolyte solutions in the treatment of cholera was carried out in India during the summer of 1971 when the disease appeared in a population of war refugees. Observations made during the epidemic substantiated the usefulness of oral therapy in circumstances of this kind. Realistic estimates of what one might expect from this mode of therapy led to a formulation of practical guidelines to its use and limitations.

The development of a simple and effective method for oral replacement of fluid and electrolytes in cholera makes an interesting story. In the normal human bowel, glucose is rapidly and actively absorbed, mainly from the duodenum and jejunum. It had been demonstrated, both in laboratory animals and man, that glucose absorption from all or part of the small bowel is accompanied by increased absorption of sodium and water. Furthermore, glucose absorption remains intact in cholera patients and, in spite of the effects of the enterotoxin, still enhances the absorption of water and electrolytes. Controlled clinical studies of hospitalized patients had demonstrated the effectiveness of oral glucose-electrolyte solutions as adequate maintenance therapy in cholera and other severely dehydrating diarrheal diseases. Furthermore, field trials had subsequently confirmed the efficacy of primary oral therapy when adequate supplies were available and trained personnel were on hand.

Could this method be used in a critical situation in which there were inadequate treatment facilities, an extreme shortage of parenteral fluids and only a few persons trained in cholera therapy? These were exactly the limitations that faced responsible agencies of the Government of India, the West Bengal government and voluntary relief organizations when cholera erupted in the Bangladesh refugee population during the summer of 1971. The needs were clear and full-scale use of oral fluid therapy appeared to be the only practical option. The Johns Hopkins Center for Medical Research and Training in Calcutta (JH-CMRT) offered its help during this critical
period and our professional and paramedical personnel went to work immediately in cooperation with governmental and voluntary agencies.

**The problem and the early approach**

By the end of May 1971 over six million people from East Pakistan, now Bangladesh, had fled the civil war and sought refuge in India. The outbreak of cholera in the monsoon months of June and July created enormous problems. The disease attacked people already devitalized by exhaustion, starvation and exposure. A heavy death toll occurred in the refugee camps, where there was an estimated case fatality ratio of 30% from cholera and cholera-like diarrheal diseases (Figures 1 and 2).

Available resources for the treatment of cholera were mobilized but basic handicaps still existed. The huge amounts of intravenous fluids that would be required, plus the problems of transport and lack of trained personnel for their administration, represented an almost insurmountable logistical problem in treating cholera effectively under such circumstances by the standard methods currently in use. We suggested the use of oral fluids as the only recourse in this situation. On the basis of previous experience cited above we were reasonably sure that orally administered electrolyte solutions with glucose would be satisfactory for maintenance of fluid and electrolytes *after* shock and severe acidosis had been corrected by intravenous fluids. Partial initial replacement of fluid loss might be provided orally. An important clue lay in the fact that, when given early in the disease...
Before the onset of hypovolemic shock, oral fluid replacement therapy alone apparently could prevent fatal dehydration.11

We organized two teams for cholera therapy including oral rehydration. Both teams worked along the border between India and East Pakistan where the need was greatest. Apart from the simple humanitarian service, we sought to evaluate the feasibility of oral therapy with locally available materials, to be administered under extremely difficult conditions. Practical recommendations for cholera therapy in similar situations have been worked out subsequently with the help of able consultants in Calcutta and elsewhere.12 We report here the observational basis of these recommendations as it grew from our experience among the Bangladesh refugees.

**Location, logistics and supplies**

Both of our treatment teams converged during the peak of the epidemic at a place called Bongaon, quite near the border where refugees were still crossing in great numbers. The treatment center was located at the subdivisional hospital in Bongaon. Two cottages with 16 beds, originally built to accommodate patients with infectious diseases, were used as cholera wards. When we arrived on June 24, 1971, an estimated 350,000 refugees were living in the vicinity of the town, with an additional daily influx of about 6000 more. The meager resources of the town were strained to the limit.

We arranged a continuous shuttle of vehicles on the 50-mile run from Calcutta to Bongaon, carrying personnel, medication, food and supplies to the center. Our own reserves of intravenous saline-lactate solution stocked originally for cholera research soon were depleted. Parenteral fluids of various sorts were then supplied by other agencies.

These included limited quantities of isotonic saline solution, isotonic saline solution with 5% glucose, Ringer’s solution with lactate and Krebs-Ringer’s solution (without lactate). Such multiplicity of fluid formulas could not be avoided under the circumstances, but was hardly ideal. Daily supplies of parenteral fluids were unpredictable and never adequate in amount.

The oral solution that we elected to use consisted of 22 gm glucose (as commercial monohydrate), 3.5 gm sodium chloride (as table salt) and 2.5 gm sodium bicarbonate (as baking soda) per liter of water. When dissolved, the mixture gives an approximate electrolyte composition of sodium 90 mEq, chloride 60 mEq and bicarbonate 30 mM per liter, and 121 mM glucose. This is the simplest formula, containing the minimum number of ingredients, previously found to be effective in severely ill patients with cholera.8 Potassium citrate or other potassium salt could have been added to advantage but was not readily available locally in sufficient quantity.

Glucose-salt packets were prepared in Calcutta; of necessity at first in the JH-CMRT library room. Each of the three components of the mixture was carefully weighed by separate technicians and poured into a small polyethylene bag in assembly-line fashion. Another technician inserted a descriptive label with instructions for dissolving in water; then he sealed one end of the bag with a hot iron. Two sizes of glucose-salt packets were made: one for a final volume of four liters and the other for sixteen liters of fluid. In the field, the dry powder was added to clean drinking water and dispensed from drums directly into the patients’ cups.

The cost was calculated to be 11 Indian “paise,” or about 1½ cents in United States currency, per liter of fluid. All materials and equipment for packaging and dispensing
were obtained locally. Packets for preparation of about 50,000 liters of oral solution were supplied by our “salt factory” for use by us and other voluntary agencies working among Bangladesh refugees.

**Plan of therapy**

To make the most effective use of our limited resources for the benefit of the largest possible number of patients, we employed a very simplified treatment regimen. In severe cases, intravenous solutions were given initially to attain at least partial correction of the fluid deficit and to combat shock and acidosis. Severely ill adults may require less than three liters intravenously during the initial six to eight hours if oral supplementation can be provided. Daily supplies of parenteral fluids were usually sufficient to meet these minimal needs, but sometimes we had none at all for periods of 24 hours or longer. Oral glucose-electrolyte solution then was given for further correction of dehydration and acidosis, and to replenish continued loss of water and electrolytes in the stools. Patients with mild to moderate dehydration, without signs of hypovolemic shock, were given oral glucose-electrolyte solution alone from the beginning. The solution was started as soon as patients would take it, usually between one and four hours after admission; it was continued until cessation of watery diarrhea. Because salt packets were widely distributed and solutions freely shared, tabulation of amounts consumed by individual patients was not possible. Very rough estimates suggest a range of 10 to 20 liters each for adults from admission until cessation of diarrhea, consistent with previous, better-controlled observations.

Potassium in the form of dihydrogen phosphate salt was administered orally to children on an individual basis. Green coconut water, with a potassium content of approximately 70 mEq/L, was given when available. Adults and large children were given oral tetracycline (when available) in a dosage of 250 mg every six hours for 48 hours; small children received half this amount on the same schedule. A normal diet was resumed as soon as possible even though the diarrhea had not completely stopped.

**Outcome of the field experience**

The height of the cholera epidemic occurred near the end of June 1971. Daily admissions of cholera patients at the Bongaon center reached a peak of about 200 and more than 3000 patients were treated in the first three weeks. The cottage facilities soon were overloaded and patients had to be placed on the floor. Finally a point was reached when literally no more floor space was available. One hundred canvas cots were sent from Calcutta and set up in a large tent beside the cottages, but the bed situation remained critical. Two adults, or as many as four children, were often huddled on the same cot. The pressure of new admissions forced us on many occasions to discharge patients after 24 hours, with only oral fluids and a small quantity of tetracycline for use on return to the camp - fortunately only a few of them needed readmission for continued diarrhea. The admission rate dropped below 60 per day after mid-July and tapered off to a trickle by the end of August.

Over 3700 patients with a clinical diagnosis of cholera were treated under our supervision during eight weeks between June 24 and August 30, 1971 (Table 1). The case fatality ratio was 3.6%. Treatment in the separate tent was exclusively under control of the JH-CMRT staff and served eventually as our demonstration ward. About 1200 patients were treated here with only 12 deaths, representing
Oral fluid therapy of cholera among Bangladesh refugees

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Table 1: Summary of mortality from cholera and cholera-like diarrheas at Bongaon treatment center, June 24 through August 30, 1971

<table>
<thead>
<tr>
<th>Patient population</th>
<th>Admissions</th>
<th>Number of deaths*</th>
<th>Case fatality ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire center</td>
<td>3703</td>
<td>135</td>
<td>3.6%</td>
</tr>
<tr>
<td>JH-CMRT demonstration unit only</td>
<td>1190</td>
<td>12</td>
<td>1.0%</td>
</tr>
</tbody>
</table>

*Approximately half of the patients died before any rehydration therapy could be started.

a case fatality ratio of only 1% among these particular patients.

Paramedical workers and relatives of patients were instructed to give oral solution freely to all patients as soon as they were able to take fluid by mouth. Patients took the oral solution avidly when they were dehydrated; when hydration was achieved they preferred to have plain water instead of salt solution. Although vomiting was common, most patients retained enough oral salt solution to maintain hydration. Paramedical workers (and even physicians) had to be convinced that a massive volume of fluid needed to be given particularly in the initial stages. Failure of oral hydration could usually be traced to the fact that, in the absence of supervision, not enough fluid had been given by attendants.

Patients and their families usually accepted the oral solution as a form of treatment. However, some of them thought that intravenous fluid was a more impressive form of therapy and tried to cajole us into using some of our scarce supply, even though the patients were doing well on the oral solution alone. In areas such as Bengal where people are familiar with cholera, “saline” is widely known to be the cure. We called the oral solution “drinking saline,” thus enhancing its acceptance as medication of real worth. Vomiting, however, was a major psychological barrier to the acceptance of oral therapy by the patients, their relatives and paramedical workers; constant persuasion was needed to maintain adequate oral intake in the face of this distressing symptom.

Workers not previously familiar with cholera therapy usually were able to start intravenous drips after only two days of training, although they were not experienced enough at that point to judge the requirements for parenteral fluid restitution and maintenance. The use of oral fluid therapy partly circumvented this difficulty since parenteral fluids were not used in the mild and moderately severe cases without shock.

Sample surveys during the epidemic

A survey was made of a sample population of the patients to determine the age distribution (Table 2). Children below six years of age constituted 38% of the patient population, in contrast to only 14% in the general refugee population. Our patient population thus was heavily weighted with infants and young children, who pose much greater therapeutic problems than adults.

Rectal swabs were taken from 108 patients for culture at the Cholera Research Centre of the Indian Council of Medical Research, Calcutta. About 79% of swabs yielded Vibrio cholerae with 92% of isolates being classical biotype (during recent years in the Calcutta area, biotype EI Tor has been predominant).
Discussion

A simple method of treatment may save lives in the cholera-affected areas of the world. Therapy of cholera by simplified oral glucose-electrolyte solutions thus assumes importance. While our studies of necessity were observational rather than quantitative, several strong impressions emerged. The following specific points can be made:

Our experience during the cholera epidemic among Bangladesh refugees confirmed the feasibility of prepackaging the glucose-salt mixture and taking it to the field in dry form. This procedure eliminates error in measuring the ingredients on the spot and greatly reduces the cost of transport. Large soluble tablets which could be dissolved in one liter of water have been suggested as a convenient way of distributing and stockpiling the materials for oral therapy in areas where they are likely to be needed, but manufacturing and packaging costs would undoubtedly be relatively high. Furthermore, it has been found that an average teaspoon when carefully levelled gives reproducible results; this was verified by preparing successive liter lots of solution and analyzing for electrolytes and glucose. Accurate measurement by volume would expedite packaging the glucose-salt mixture by eliminating the tedious weighing procedure.

The prepackaged glucose-salt mixture with enclosed instructions in unmistakably simple terms makes therapy much easier for people with no previous training or experience. Intelligent people in camps and villages can be taught to recognize cholera-like diarrhea and start oral replacement early. This was attempted by newspaper accounts and radio announcements during the Bangladesh crisis and apparently reached many people in the area.

To be most effective, oral fluid therapy must be given early in the course of the illness. As with intravenous fluids, one must convince physicians and paramedical workers of the massive fluid requirements during the initial phase of rehydration. When circumstances preclude weighing patients or measuring stool output in the usual ideal manner, attendants need to be urged simply to give as much fluid as the patient can take by mouth. Overhydration from oral fluids was not observed at Bongaon, where this was the procedure.

Table 2: Estimated age distribution in study patients in comparison with general refugee population samples

<table>
<thead>
<tr>
<th>Age group</th>
<th>General population* Bangladesh refugees</th>
<th>Patient population Bongaon treatment center</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No.</td>
<td>Percentage</td>
</tr>
<tr>
<td>0-5</td>
<td>62</td>
<td>14%</td>
</tr>
<tr>
<td>6-15</td>
<td>164</td>
<td>36%</td>
</tr>
<tr>
<td>&gt;15</td>
<td>226</td>
<td>50%</td>
</tr>
<tr>
<td>Total</td>
<td>452</td>
<td>100%</td>
</tr>
</tbody>
</table>


* Four liters of the JH-CMRT oral solution required the following amounts of dry ingredients, measured by volume: sodium chloride, as table salt, 4 level teaspoonfuls; sodium bicarbonate, as paking soda, 3 level teaspoonfuls; commercial glucose (as used in soft drinks), 20 level teaspoonfuls.
Vomiting during the initial phase of rehydration is perhaps the greatest barrier to effective oral therapy. Vomiting is probably associated with hypovolemia or with continuing acidosis; it must be met by rapid administration of appropriate fluids by any available route, including oral administration or nasogastric gavage. This point cannot be overemphasized and is an important key to successful therapy.

Results of treatment in the Bongaon center, with a case fatality ratio of less than 4%, compare favorably with results of standard therapy in well-organized modern treatment centers. We believe that many more persons were provided effective treatment and more lives saved than if we had depended entirely on the use of available parenteral fluids administered only by trained personnel.

**Summary**

Confirmation of the effectiveness of orally administered electrolyte solutions with glucose in the treatment of cholera without hypovolemic shock was obtained by a crucial field trial during the cholera outbreak that erupted in the summer of 1971 among Bangladesh refugees at Bongaon, West Bengal, India. Extremely adverse logistic and administrative conditions prevailed. A total of 3703 patients, including severe cases treated initially by limited supplies of parenteral fluids and mild to moderately severe cases treated by oral therapy alone, were admitted to the Bongaon treatment center; the overall case fatality ratio was 3.6%. A special demonstration unit provided treatment for 1190 of these patients with case fatality ratio of 1%.

The oral solution provided sodium 90 mEq, bicarbonate 30 mEq and chloride 60 mEq per liter, along with glucose 22 gm per liter (121 mM), prepackaged for mixing with water in the field. Potassium supplementation was given orally on an individual basis. Advantages of the oral solution included local availability of ingredients, minimal cost of preparation and transport, ease of administration, safety in the hands of inexperienced personnel after only brief instructions, early accessibility of treatment and reasonable effectiveness especially when used very early in the course of the disease prior to extreme dehydration, shock and acidosis. In severe cases, considerable sparing of intravenous fluids resulted from the adjunct use of the oral solution.

**Acknowledgments**

We wish to thank Dr. H. L. Saha, former Director of Health Services of West Bengal, Dr. A. Mondal, Director of the WHO-ICMR Cholera Research Centre, and Dr. K. N. Neogy, Professor of Microbiology of the Calcutta School of Tropical Medicine, for their counsel and encouragement.

Dr. S. P. Dey, WHO-ICMR Cholera Research Centre, did the bacterial cultures on specimens submitted from the Bongaon treatment center.

**References**


Why is every country not primed to use oral rehydration therapy to treat cases of diarrhoea?

Richard A Cash

In March 1971 civil war broke out in the then East Pakistan, which nine months later led to the birth of Bangladesh. Within months millions of refugees had crossed the Indian border and so by the conclusion of the war in December 1971, there were an estimated 10 million refugees. With such massive displacement of people it was inevitable that the strain on resources, especially water and sanitation, would lead to outbreaks of diarrhoea. As cholera was endemic to the region it was no surprise when major epidemics occurred in the refugee camps beginning in early June 1971.

In 1968 clinical trials at the Pakistan SEATO Cholera Research Laboratory in Dhaka (now the International Centre for Diarrhoeal Disease Research, Bangladesh—ICDDR,B) had demonstrated that an oral-glucose electrolyte solution (ORS) could maintain hydration in cholera patients and in other patients with severe dehydrating diarrhoea. Intravenous (IV) fluid requirements were reduced by 80% in patients treated with ORS. These results were subsequently confirmed at the Johns Hopkins Center for Medical Research and Training in Calcutta (now Kolkata) (JH-CMRT). The first large field trial carried out at Matlab Bazar, in then East Pakistan (now Bangladesh), confirmed the efficacy of ORS in a rural hospital setting when trained doctors, nurses or health workers administered the treatment. The ORS alone significantly reduced the degree of severe dehydration if given early in the course of illness.

In June 1971 a cholera outbreak began in the subdivisional area of Bongaon, about 50 miles from Calcutta (now Kolkata), the home to about 350,000 refugees and the site of a government hospital with 16 beds. Living conditions, including resources for water and sanitation were stretched well beyond the limit of local resources. Two teams were organized by the JH-CMRT to provide care to the local population. The ingredients for ORS packets were weighed and measured at the office in Calcutta (Kolkata) and taken to refugee camps. A simplified treatment plan was developed that called for IV for those admitted in shock, with ORS begun when the patient was out of shock and alert enough to take ORS (usually within one to four hours after initiating therapy). The case fatality rate was kept to 3.6% overall (n=3703 patients) and was less than 1% (n=1200) in the JH-CMRT demonstration ward. There had been

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estimates of cholera-related mortality in the camps of up to 30% before initiation of the new treatment protocols. The study was not quantitative, as records of IV volumes or oral fluids per case could not be kept, but a number of very important observations were made.

It was clear that trained persons could dramatically reduce mortality in even the most basic of clinical settings under disaster conditions. Treatment with ORS, if begun early in the illness, could obviate the need for ORS in most patients. Even if the patient vomited, the ORS was continued as emesis soon stopped. Physicians and other health providers had to be convinced to give large volumes of ORS and not hold back. There were no cases of over-hydration in those treated with ORS. Family members and village health workers could be taught to be very effective in helping to treat patients.

A number of developments have since been added to the effectiveness and access of ORS. These include: the use of rice or cereal-based ORS; the use of community-based workers to deliver home-based ORS by packet or by the pinch-and-scoop method; and the demonstration that low-osmolarity ORS could reduce the volume of diarrhoea in non-cholera diarrhoeas. But the basic principle remains—stool fluid losses must be corrected and hydration maintained with a physiologically sound solution. The ORS and the therapeutic method known as oral rehydration therapy (ORT) have been widely promoted by WHO, national governments and nongovernmental organizations (NGOs), and are now widely available throughout the world for cholera and all other forms of dehydrating diarrhoea.

It is disheartening, therefore, to see that today, 40 years after the publication of a classic paper by Mahalanabis et al., there is so much unnecessary morbidity and mortality from outbreaks of cholera in areas affected by natural and man-made disasters. In July 1994 over 40 000 people died from cholera and dysentery in the Rwanda refugee camps. An ongoing outbreak of cholera in Haiti in 2010-2011, following a devastating earthquake, is estimated to have led to over 7000 deaths and counting. Why have the lessons mentioned by Mahalanabis and colleagues not been applied to these and similar situations? Why is not every country primed to use ORT for all cases of diarrhoea, especially during outbreaks of cholera? Does our familiarity with ORT breed contempt? Has its simplicity led to its being set aside for fancier interventions in our high-tech world? In that case why the ingredients could not reach the Rwandan camps and the Haitians? Our inability to deal with these outbreaks represents a significant public health failure in affected countries.

Each year approximately 1.3 million children die of dehydration secondary to diarrhoea. It is estimated, however, that less than 30% children have access to ORT in developing countries. This calls for a renewed emphasis on the use of ORS globally for all cases of diarrhoea. It is important that international agencies ensure that ORS is part of the armamentarium of emergency preparedness kits everywhere in the world.

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‘Health for All’ through the primary health care approach was initiated in 1978. All the eight elements of primary health care are delivered at the grass root level through sub-health centres by health workers (male and female) in co-ordination with many other departments in India. Women and children below five years are a priority group. It is very important to understand their perspective to improve primary health care.

In August 2011, we went to some villages near Shimla – the capital city of Himachal Pradesh located in northern India to demonstrate to medical students how immunization sessions are conducted at sub-health centres, and how ‘breast feeding week’ is celebrated at community health centres. These events presented an opportunity to us for interacting with the women. Most of the women were either pregnant or had recently delivered a baby. Some of them were accompanied by their mothers-in-law also, and women members of the Panchayat - an elected village committee – also participated in these events. We spoke to them to elicit their view point about primary health care.

Most of the women felt that the sub-health centre should be built within the inhabited area of the village rather than at its periphery so that services are easily accessible. They suggested that if it is possible, the sub-health centre should be exchanged with the liquor shop which is situated in the centre of the village and is always (even in the night) accessible to people. One of them retorted: “It seems government is more concerned with the safety of drunkards!” All of them felt that the “health centre must be situated within the village so that the female health worker can feel safe and stay at night”.

Though immunization and other services are offered free of charge, most of the mothers have to spend more time and pay transport costs to avail these services. Many of them preferred to pay a little more and go to Shimla for antenatal care and institutional delivery. The footpath leading to the sub-health centre is not women-and children-friendly. An older woman said, “there is always a fear of dogs and monkeys. Moreover, the path becomes very slippery during the monsoon and after a snowfall”. One of the women in the group said, “we visit the sub-centre mainly for immunization, iron (tablets) and for some minor ailments; for rest of the problems we prefer to go to the big hospital in Shimla as good medicines are also not there in the health centre”. She also recalled with regret that during winter they had to carry their daughter-in-law on their back, for nearly
two kilometres in the snow, while she was in labour. She wished people from her village could come together and provide some land for the construction of a health centre in the village. Though these villages are near Shimla, in an emergency medical care is not within their reach despite the existence of an emergency ambulance scheme, because all villages are not linked with the road. During winter it becomes very difficult to avail any medical help from the hospital.

Women consider the sub-health centre to be an important village health institution. They recognize that services like immunization, treatment of minor ailments, distribution of chlorine tablets to purify water and contraceptive services are important. They were quite happy with the services provided by the health workers. One of them said, “our workers are even better than many doctors, but what can they do if proper medicines and facilities for conducting deliveries are not made available to them?” Another woman said, “they are the ones who are available in times of difficulty”. Women acknowledged the village birth attendant for maternal care because the female health worker does not conduct deliveries. “Though this is the modern era, we cannot ignore the valuable services of the village dai (traditional birth attendant) as she is always ready to help”, an older member of the group opined. Most of the women emphasize that safe delivery is the cornerstone of maternal and child health. If a sub-health centre is developed for conducting deliveries and is linked with road to a hospital, it will reduce maternal deaths at a lower cost. They also wished for more co-ordination among the village dai and the female health worker. They considered the anganwari worker and village dai equally important as far as services to mothers and children are concerned. One of the senior members of the group said, “government should think of training female health workers along with aganwari workers and dais in conducting deliveries so that they can work together”

According to most women there is good coordination between the female health worker and the anganwadi worker to provide services to mothers and children. Anganwari centres of the Integrated Child Development Services Scheme (ICDS) are being used to deliver immunization, health education, growth monitoring and antenatal care by the female health workers. However, the linkages between health workers and doctors were perceived to be inadequate. It was felt the services of health workers are not taken into account at the hospitals. Women wished that a doctor, especially a lady doctor, could be deputed to provide services at least once a week in their sub-health centre but they did not clarify which of the services a doctor would provide.

Women members of the Panchayat (elected village committee) informed that the health of mothers and children was not on the agenda in any of the village meetings (gram sabha). One of them said, “people are more concerned about the schemes that provide them direct financial opportunities. The health of women and children is never a big issue for them (villagers)”. Safe drinking water always remains a controversial issue because it is not addressed together by the irrigation and public health engineering department and the sub-health center workers. It is a specially important issue during the monsoon season. Cleanliness around the Panchayat office was another issue which lacked clarity - whether to take it to sub-health centre for discussion or not.
It seems that despite the existence of the primary health care approach, geographical accessibility is a major issue in many hilly states like Himachal Pradesh. Developing sub-health centres for conducting deliveries in coordination with other functionaries at the village level is a challenge. There is a definite lack of inter-sectoral coordination at the village level. The sub-health centre is still considered as a ‘medical care centre’ which is the felt need of the people. The concept of primary health care has been restricted to the delivery of primary medical care. To develop a holistic understanding of the health issues and to prepare villagers to take action in the right direction to rectify the problems remains a formidable challenge.
Managing quality in health care

PR Sodani
Publisher: Rawat Publications, Jaipur (India), 2010: ISBN 81-316-0368-7; 180 pages, Indian Rs. 595

The quality of care is an important factor that increases patient satisfaction. Good quality care is also critical for achieving the Millennium Development Goals (MDGs). However, quality has been perceived differently in various communities. A lot needs to be done to improve quality in health-care programmes. Health managers require a thorough understanding of not only the concepts but also the practical ways to enhance the quality of care.

Dr Sodani has designed this book as a primer for health professionals working in the area of health systems and public health, as well as for those engaged in research on quality in health care. It provides decision-makers at state and district levels with an understanding of planning, strategizing and implementing programmes aimed at providing quality care to patients. The book is a useful resource for students and to some extent for teachers of health management.

Six chapters of the book cover various topics related with measuring and diagnosing the quality of care, and strategizing and implementing the quality-of–health-care programmes with particular focus on reproductive and child health-care services at district level. The opening chapter of the book presents a brief overview of quality of care. The second chapter presents the quality-of-care frameworks developed by Donabedian, Bruce, International Planned Parenthood Federation, Pan American Health Organization, International Council on Management of Population Programmes, as well as the United Nations Population Fund’s Reproductive Health Quality Framework. However, it would have been better if the book presented the advantages and disadvantages of these frameworks in a tabular form. As Bruce’s framework is accepted worldwide for family planning services, an effort has been made to see its relevance for other health components like safe motherhood. Literature review on quality of care is discussed in the third chapter. The current status of quality of health care in Udaipur district of Rajasthan in India is also discussed in detail taking into account the six elements of quality of services: choice of methods; information given to users; technical competence; interpersonal relations; follow-up or continuity mechanisms and appropriate constellation of services.

Chapter four outlines the method of determining the factors responsible for the current quality of care. For this, the systems approach has been used, employing Jain’s Diagnostic Model that consists of five components: desired output; environment; input; information; and process. This approach is useful for health managers who are involved in health planning. Another chapter deals with strategy formulation to improve the quality of services. Several methods have been identified
to evaluate strategies. Two methods have been used: Portfolio Analysis and Strategic Position and Action Evaluation Analysis. In the last chapter, the steps to translate a strategy into a plan of action have been elucidated. It is good that a case study has been used to explain how quality can be measured at district level, as well as the strategies that were found to be useful.

Several countries in the WHO South-East Asia Region are struggling to achieve the MDGs, the momentum for which can be increased by improving the quality of care. This book can be of help to health professionals and managers as it provides knowledge on how to improve the quality of health services at district level. This in turn will help improve health system performance that ultimately results in achieving the MDGs. Quality of health care in itself is an important area that needs attention. The book is a good resource for building conceptual understanding on the quality of health services, as well as for improving it in the current context of low-and middle-income countries.

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Jaipur 302011, India
e-mail: kalpasharma15@gmail.com
The South-East Asia Region accounts for approximately one third of the global total number of injury-related deaths as well as the total disability adjusted life years (DALYs) lost to injury. However, injury has long been a neglected public health problem in the Region. Even though medical professionals have a critical role in treating trauma victims as well as promoting injury-prevention activities, it has been observed that the present medical and nursing curriculum in the Member States does not adequately cover violence and injury prevention. Consequently, several intercountry consultations were held to identify the gap regarding violence and injury prevention education, and the core areas for strengthening injury prevention and control (IPC) in medical and nursing education. Based on these findings, a group of experts prepared this handbook on injury prevention and control for use in undergraduate medical curricula, considering the core competencies required and the learning process needed to achieve the competencies. This handbook also describes the approaches for strengthening communication, counseling, and advocacy skills, which are especially critical for violence and injury prevention.

Management of sexually transmitted infections - Regional guidelines


Sexually transmitted infections (STIs) continue to be of major public health concern in the South-East Asia Region of WHO (SEAR). Failure to adequately treat STI at an early stage may lead to serious complications and sequelae. STIs have also been found to increase the
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risk of sexual transmission and acquisition of HIV infection. The rise in incidence of anorectal infections among men who have sex with men, and the increasing lack of response to third generation cephalosporins in SEAR countries are other areas of concern. Almost all countries in the Region have national guidelines for the management of STI, based on either syndromic management or etiological diagnosis or both. However, only a few countries have updated/revised their management guidelines recently. These new regional guidelines for STI management take into consideration the new technologies and therapeutics that are now available.

Noncommunicable diseases in the South-East Asia Region: situation and response


This report describes the current burden of noncommunicable diseases in the South-East Asia Region, their underlying risk factors and socioeconomic determinants. The report also summarizes the progress countries are making for tackling the NCD epidemic, provides the base for regional and country responses, highlights some good country practices and recommends the way forward in addressing NCDs and risk factors in a comprehensive and integrated way. The report is intended for policy-makers in health and development, health professionals, researchers and academia, and other key stakeholders involved in prevention and control of NCDs.
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Original research articles on public health, primary health care, epidemiology, health administration, health systems, health economics, health promotion, public health nutrition, communicable and non-communicable diseases, maternal and child health, occupational and environmental health, social and preventive medicine are invited which have potential to promote public health in the South-East Asia Region. We also publish editorial commentaries, perspectives, state of the art reviews, research briefs, report from the field, policy and practice, letter to the editor and book reviews etc.

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