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Pitout JDD, Church DL, Gregson DB, Chow BL, McCracken M, Mulvey M, Laupland KB (2007). Molecular epidemiology of CTXM-producing *Escherichia coli* in the Calgary Health Region: emergence of CTX-M-15-producing isolates. *Antimicrob. Agents Chemother.* 51: 1281-1286.

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Shifting from infectious diseases to non-communicable diseases: A double burden of diseases in Bangladesh

Shakeel Ahmed Ibne Mahmood, Shaiful Ali and Rashedul Islam

Department of Public Health, North South University, Bangladesh.

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Double burden diseases are a serious global problem, which is currently affecting many low and middle income countries, including Bangladesh. However, proper understanding of the need for a joint intervention against both infectious diseases and non-communicable diseases (NCD) has arisen only recently. Excessive intake of calories and poor health hygiene is one of the main common factors behind those conditions and risk factors, along with other lifestyle choices and genetic predisposition. The keys to controlling double burden diseases are primary prevention through promotion of healthy life style which is necessary during all phase of life. Action to reduce should focus on preventing and controlling the risk factors in an integrated manner. Intervention at all levels of society, from communities to governments, private organizations and non-governmental groups, is essential for prevention by amplifying awareness of people about a perfect and healthy lifestyle.

Key words: Infectious disease, non-communicable disease, nongovernment organizations, government strategies.

INTRODUCTION

The World Health Organization (WHO) stated “in many regions, that some of the most formidable enemies of health are joining forces with the allies of poverty to impose a double burden of disease, disability and premature death in many millions of people” (WHO, 2011a). This is what is happening in South Asia, which has one quarter of the global population, but where about half of the population live below the poverty line and has limited access to health care. The persistent anguish of infectious diseases is now being coupled with the non-communicable diseases (NCDs) from the aging population, posing tougher problems for these middle- and low-income countries (LMICs) of having to face a double burden of disease with limited resource. The demographic and epidemiological transition has wrought this double burden of diseases in today's world. South Asia has made fair economic progress in recent decades, but is struggling to find a road towards sustainable development (Abul-Ghaffar, 2004).

NCDs are increasingly recognized as the next big challenge for the health sector in low- and middle-income countries (LMICs). Since the United Nation (UN) high level meeting on NCDs, held in New York in 2011, many studies have identified the increasing contribution of NCDs and their underlying risk factors to the global burden of disease. These findings have implications for health services and systems, particularly in LMICs, where the prevalence of NCDs is rising, often surprisingly rapidly, and where the global debate on health systems has been mainly focused on communicable disease and maternal and child health (Helan and Krishna, 2013).

Similar to many low income countries around the world, Bangladesh is in the midst of an epidemiologic transition, where the burden of disease is shifting from a disease profile dominated by infectious diseases, under-nutrition and conditions of childbirth to one increasingly characterized by NCDs (Bleich et al., 2011). Indeed, in the context of developing economies, there is considerable

evidence to support the hypothesis that infectious cause from under nutrition is primarily concentrated among the poor, while NCD's from over nutrition is a problem among better-off groups, (Subramanian and Smith, 2006) even though this social pattern is likely to change as countries like Bangladesh attain a certain level of economic development. For understanding demographic and epidemiological transitions, Health and Demographic Surveillance System (HDSS) has played an important role in developing and resource-constraint setups, where accurate information on vital events (e.g. births, deaths) are not properly recorded. The primary aim of this study was to assess current health situation and trend of disease burden shifting from infectious to NCD's among the people living in Bangladesh.

Emerging diseases

Emerging diseases are diseases that have newly appeared in a population or have existed but are rapidly increasing in incidence or geographic range. Some of these diseases are new and hence our body possesses no natural defense against them. They include AIDS and Ebola (Library Think Quest, 2013).

Re-emerging diseases

Re-emerging diseases are age-old diseases that have increased its prevalence again. These diseases include tuberculosis, cholera, malaria, etc. These diseases were previously treatable, but have developed resistance to the drugs used to treat them. The increased migration due to war and international travel has also facilitated the spread of disease. Cholera, for example has increased due to increase in shipping. Malaria has also increased due to the resistance developed to the drugs used to kill the parasites and its mosquito-borne vector (Library Think Quest, 2013).

Double burden of disease

Double burden of disease refers to the dual burden of NCDs and infectious diseases upon the LMICs. In fact, NCDs such as cardiovascular diseases and diabetes are emerging and imposing now a new burden to those countries with limited resources and yet they are still struggling to meet the challenges of infectious diseases such as tuberculosis and HIV/AIDS (Wiki, 2013).

METHODOLOGY

Information was retrieved from documents available mainly in electronic database and on the websites of specialized journal, using the terms double burden disease and health impact of double burden disease in Bangladesh. Results and comment from other

researchers work were also evaluated. Around 90 research papers were retrieved from the database (websites) of several national and international publications and among them, about 38 research papers were reviewed for preparation of this article. The most important, being online collection from different public health journals on double burden disease related issues, reports on quantitative and qualitative studies, policy analysis of the existing situation in Bangladesh, and government strategies. A scrutiny of the article revealed that some papers were also presented in international conferences. Collected documents were skim read to cases, whether they contained information in conjunction with Bangladesh health structure and double burden diseases. Data accruing from the research paper were analyzed and data were presented in table, chart and picture as per the requirement.

The epidemiologic transition

The first epidemiologic transition was associated with a rise in infectious diseases that accompanied the neolithic revolution. The second epidemiologic transition involved the shift from infectious to chronic disease mortality associated with industrialization. The recent resurgence of infectious disease mortality marks a third epidemiologic transition characterized by newly emerging, re-emerging, and antibiotic resistant pathogens in the context of an accelerated globalization of human disease ecologies (Ronald et al., 1998).

The epidemiological transition model developed by Omran (1971) "focuses on the complex changes in patterns of health and disease, the interactions between these patterns, and their demographic, economic, and sociologic determinants and consequences" (Agyei-Mensah and Aikins, 2010).

The model shows a distinctive shift in the disease pattern of a population. Mortality falls during the demographic transition. The acute, infectious diseases are reduced, while chronic, degenerative diseases increase in prominence, causing a gradual shift in the age pattern of mortality from younger to older ages (Omran, 1971). Following are the consequences: decline in deaths from infectious diseases; increase in deaths from degenerative diseases; decline in overall death rates; increase in life expectancy (Omran, 1998).

Global scenario

The global scenario of double burden of diseases shows different situations in developed and developing countries due to their respective socio-economic conditions. There are commonalities in the major risk factors, but huge differences in their approaches to provide health care support to their respective population. The leading global risks for mortality are high blood pressure (responsible for 13% of deaths globally), tobacco use (9%), high blood glucose (6%), physical inactivity (6%), and overweight and obesity (5%). These risks are responsible for raising the risk of chronic diseases such as heart disease, diabetes and cancers. They affect countries across all income groups: high, middle and low (Figure 1) (WHO, 2011b).

There is an increasing trend in developing countries, where the demographic and socio-economic transition imposes more constraints on dealing with the double burden of infectious and non-infectious diseases arising from a poor environment which is characterized by ill-health systems. It is predicted that, by 2020.

NCDs will cause seven out of every ten deaths in developing countries. Among NCDs, special attention is devoted to cardiovascular disease, diabetes, cancer and chronic pulmonary disease. The burden of these conditions affects countries worldwide but with a growing trend in developing countries. Preventative strategies must take into account the growing trend of risk factors associated with these diseases. It may also be noted that despite

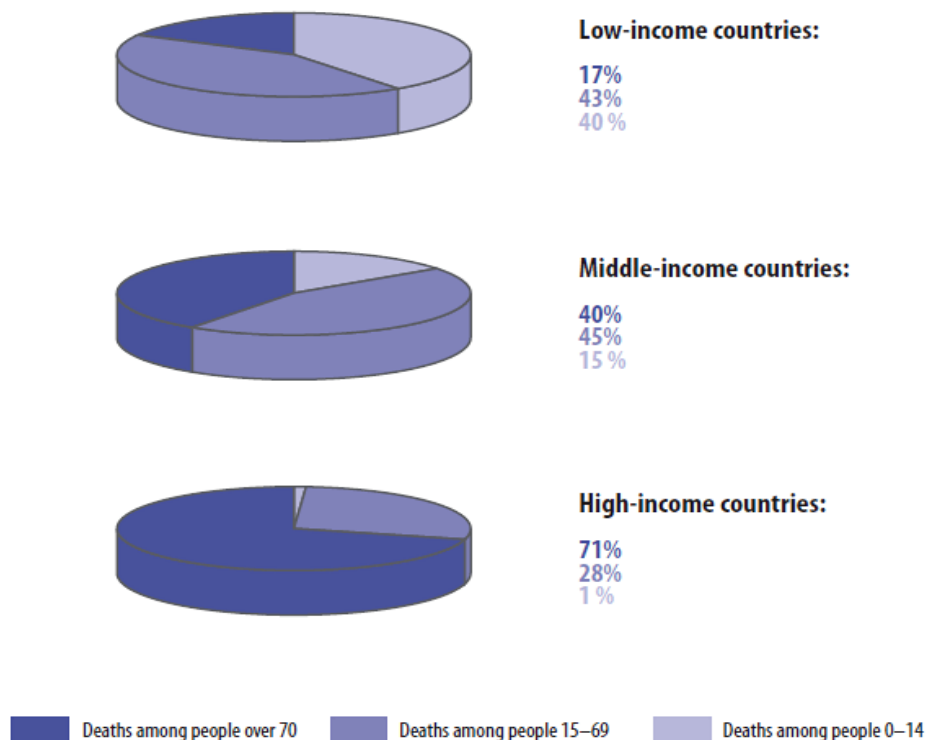


Figure 1. The top 10 causes of death (WHO, 2011b).

the success of vaccination programmes for polio and some childhood diseases, other diseases like AIDS, tuberculosis, malaria and dengue are still out of control in many regions of the globe (Boutayeb, 2005). Most of the Asian countries are double burdened in the following ways due to this epidemiological transition: (1) infections and nutritional deficiencies are receding but still prevalent; (2) cardiovascular diseases (CVDs), cancers, diabetes, neuropsychiatric ailments and other chronic diseases are increasing.

Estimating the burden of non-communicable diseases

1. Mortality, morbidity, and disability attributable to the major NCDs account for about 60% of all deaths and 47% of the global burden of disease; these rates are expected to rise.
2. Almost half of the adult disease burden in South Asia is attributable to NCDs.
3. Environmental factors are the major determinants of almost all NCDs.
4. Obstacles to managing the NCDs epidemic in South Asia include sedentary lifestyles, extreme poverty, and inadequate health systems.
5. Establishment of surveillance systems for NCDs and their risk factors is essential for developing prevention strategies and monitoring the impact of control programmes.
6. Pilot programmes are now under way in some of the countries to establish and evaluate such systems (Abdul-Ghaffar et al., 2004).

Burden of NCDs in South Asia

The demographic transition in South Asia along with unplanned urbanization and human lifestyle changes are adding the burden of

NCD, where infectious diseases are still highly rampant. Double burden of diseases in LMICs is well recognized. Thus proper understanding of the need for a joint intervention against both infectious diseases and NCDs has taken place only recently (Bygbjerg, 2012). In 2008, the proportion of premature deaths due to NCD in population less than 60 years of age in low-income countries was 41%, in lower middle-income countries 28%, and in high-income countries only 13% (WHO, 2011c). The most frequent causes of death, which includes cardiovascular diseases, diabetes, cancers and chronic lung disease, and the main underlying risk factors were increased blood pressure (13% of deaths globally), tobacco use (9%), elevated blood glucose levels (6%), physical inactivity (6%), and overweight and obesity (5%) (WHO, 2009a). Excessive intake of calories is one of the main common causes behind those conditions and risk factors, together with other lifestyle choices and genetic predisposition.

Conversely, infectious diseases are still difficult to control, especially in young children, even despite the fact that most of the necessary tools and knowledge about their prevention, treatment and control are available (Rudan et al., 2012). These tools are both effective and reasonably priced, but they do not reach those, who need them (Bahl et al., 2009). Four communicable diseases still account for nearly 50% of global child mortality-acute respiratory diseases, diarrhoea, neonatal sepsis and malaria (WHO, 2008). An important underlying risk factor for those diseases is undernutrition. It was estimated that as much as 35% of child deaths could be attributed to macro- and micro-nutrient undernutrition (Black et al., 2008). Additionally to its effect on mortality, undernutrition also affects human development in many aspects (Ivana Kolčić, 2012).

The burden of non-communicable diseases, widely seen as problems of developed countries, is increasing even in countries where hunger is endemic. This sharp increase is associated with changes in lifestyles, increased smoking and shifts in dietary habits: meat and dairy products with high fat, sugar and salt, as well as

Table 1. Vital statistics of Bangladesh (WHO, 2009b).

Total population	148,692,000
Gross national income per capita (PPP international \$)	1,810
Life expectancy at birth m/f (years)	69/70
Probability of dying under five (per 1 000 live births)	46
Probability of dying between 15 and 60 years m/f (per 1 000 population)	163/136
Total expenditure on health per capita (Intl \$, 2010)	57
Total expenditure on health as % of GDP (2010)	3.5

reduced physical activity. The developing countries of the region now shoulder a double burden of communicable and NCDs. As the region battles communicable diseases, NCDs have emerged as serious health threats.

Smoking

Solitary is largest avoidable cause of illness and untimely death. Smoking affects every limb in the body and causes a range of cancers. It harms both smokers and non-smokers. Above 100,000 children worldwide start smoking each day. Around half of them live in Asia.

Cardiovascular diseases and diabetes

Drug mistreatment disrupts life in addition to threatening human security. The pervasiveness of HIV/AIDS reached very high in a very short stage of time. As the NCD epidemics advance, the risk of cardiovascular diseases affects all sections of society, with the poor being the most susceptible. Diabetes has risen more rapidly in South Asia than in some other parts of the world.

Obesity

Obesity is a major contributing factor to the global burden of disease and disability often co-exists with under-nutrition in increasing number of countries. The rise of childhood obesity is upsetting. Obesity and overweight pose a major risk for serious diet-related chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension as well as certain types of cancer.

Mental health

Mental health emerged as a major public health issue. Worldwide, depressive disorders and schizophrenia are responsible for 50 to 60% of all suicide cases. Five out of 10 leading causes of disability are related to mental disorder, including depression. With increasing population ageing in the region, mental disorders are commonly associated with old age, such as despair and senile dementia.

Hearing

Around 120 to 140 million people worldwide have disabling hearing difficulties, mainly due to exposure to noise. Din pollution is in charge for sleep disturbances, cardiovascular and psycho-physiological effects such as hypertension and anxiety.

Work-related diseases and injuries

An estimated 1 to 2 million people pass away from work-related diseases and injuries annually. Work-related unwell health is in attendance in all settings international. The risks and hazards connected with work are largely knowledgeable by means of additional than not restricted to, low-income and other vulnerable groups, such as women, children and minorities (Financial Express, 2012).

These figures are likely to be higher if current diagnostic criteria are used for diagnosis. South Asians have been observed to have a high risk of developing diabetes at lower levels of body mass index than Western populations.

Double burden of diseases in Bangladesh

Bangladesh is in the early stages of the demographic transition, which is expected to advance in the future. The proportion of the population (65 years and above) will move from 4.5% in 2000 to 6.6% in 2025 (U.S Census Bureau, 2013).

Along with demographic transition, Bangladesh has also been going through a rapid epidemiologic transition in which NCDs now account for two-thirds of all deaths. In 2004, NCDs accounted for 61%, with the remainder from communicable diseases and maternal and child health (MCH) issues. Of the total burden, CVD accounts for 13.4%, mental health 11.2%, cancer 3.9%, respiratory diseases 4.0%, diabetes 1.2%, and injuries 10.7% (U.S Census Bureau, 2013). However, the vital statistics of Bangladesh (Table 1) shows that in reality the life expectancy has increased which is indicative of the fact that the government has taken the problem seriously and addressing it with its meager resources.

Bangladesh is yet to develop a national NCD plan that includes a human resources plan to cover prevention, diagnosis and treatment. At present, there is no investigation of NCD related morbidity and mortality. There is a need for more complete surveillance and information related to the economic burden of these diseases. Coordination is lacking between public and private services. However, drugs for treating NCDs are not included in the list. The strategic plan recognizes the role of different actors, but fails to identify strategies to engage NGOs, academic institutions, research organizations and autonomous purchasing power parity (PPP). There is minimal involvement of private agencies, NGOs, PPPs and development partners in NCDs (Alam et al., 2013).

Furthermore, there is lack of clear business case and advocacy strategy, and community awareness of the issue is low. NCD prevention and treatment are not included in the primary care essential services package. Most people, including the poor, use private practitioners for first line clinical care. It is unclear how these services will be coordinated. It is also mentioned in this paper that more research needs to be done on social and economic factors related to NCDs. Research on health insurance is needed. Public and private insurance models should be examined and should

Table 2. Bangladesh's HDI Trends (UNDP, 2013).

Year	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (2005 PPP\$)	HDI value
1980	55.2	4.4	2	0.649	0.312
1985	56.9	4.5	2.4	0.715	0.333
1990	59.5	5	2.9	0.762	0.361
1995	62.1	6	3.3	0.860	0.397
2000	64.7	7	3.7	1.003	0.433
2005	66.9	8	4.2	1.220	0.472
2010	68.6	8.1	4.8	1.631	0.508
2011	68.9	8.1	4.8	1.701	0.511
2012	69.2	8.1	4.8	1.785	0.515

Table 3. Bangladesh's HDI indicators for 2012 relative to selected countries and groups HDI (UNDP, 2013).

Country	HDI value	HDI rank	Life expectancy at birth	Expected years of schooling	Mean years of schooling	GNI per capita (PPP US\$)
Bangladesh	0.515	146	69.2	8.1	4.8	1,785
Pakistan	0.515	146	65.7	7.3	4.9	2,566
Nepal	0.463	157	69.1	8.9	3.2	1,137
South Asia	0.558	-	66.2	10.2	4.7	3,343
Low HDI	0.466	-	59.1	8.5	4.2	1,633

include NCDs (Alam et al., 2013).

At present there is no investigation of NCD related morbidity and mortality. A national survey of NCD risk factors was carried out in Bangladesh, using WHO STEPS approach. This first nationally representative survey provides essential information on key indicators of NCD risk factors and creates opportunities for policy makers and stakeholders to adopt appropriate interventions. Almost all adults (98.7%) have at least one risk factor and a significant section of people have two or more risk factors (Islam, 2012).

Bangladesh has been experiencing epidemiological transition from communicable disease to non communicable disease (NCD) which has burdened the health system and inflicted great cost on the society. Cardiovascular disease, diabetes, chronic respiratory disease, cancers and other NCDs evolve from the complex interaction of multiple determinants and risk factors such as tobacco use, unhealthy diet, physical inactivity and excess adiposity. Targeted interventions to identify and address these determinants and risk factors have become a public health priority for Bangladesh. Different studies have been conducted to identify these common risk factors and prevalence of NCDs in Bangladesh. However, there exists no accepted surveillance system for NCD at the national level (Islam, 2012).

NCDs have been taking an increasingly greater toll both socially and economically in Bangladesh, and the epidemiologic transition is well documented. Key development partners, including the major donors, are yet sufficiently focused on NCDs to provide support specifically for combating chronic diseases. Policy makers have a key role in this process (Alam et al., 2013).

The trend of selected causes of death demonstrates that in next two decades, deaths due to communicable diseases will decline substantially and the mortality due to NCDs will increase at massive proportions. It can be possible through establishing proper diagnostic facilities and referral system by incorporating such provisions in the next Strategic Investment Plan and updating the health policy accordingly. The policy makers should also devise

provisions of behavior change activities to prevent major NCDs (namely: diet, exercise, periodic screening of risk factors) and treatment of selected NCDs into the Essential Services Package (ESP), in addition to the existing services (Karar et al., 2009).

General health situation

Though Bangladesh is the world's worst climate victim where natural disasters, huge loss of lives, assets and infrastructures are almost annual event and then the population density is the highest in the world (980 km²), yet the country is making steady progress. The following statistics speak for themselves: UN-MDG4 Award in 2010 (IMR41/1,000 Live Births-BBS, 2008); MMR194/100,000 live births (BMMS, 2010), that is, a 66% reduction in MMR between 1990 and 2010 (574 vs. 194/100,000 live births) MDG5 requires 75% reduction by 2015; Full immunization coverage rate for children: >75% (EPI, CES 2009); Life expectancy at birth: 67 years (BBS, 2008); Poverty rate: 35.2% (2010), 43.8% in 2005 (8.6% reduction in 5 years) (Shah Monir Hossain, 2011).

Bangladesh's human development index (HDI) value and rank

Bangladesh being a poor country economically now stands at a cross road of spending on economic and social development activities or addressing the new dimension of double burden of diseases. Bangladesh's HDI value for 2012 is 0.515, which is in the low human development category, positioning the country at 146 out of 187 countries and territories. The rank is shared with Pakistan. However, between 1980 and 2012, Bangladesh's HDI value increased from 0.312 to 0.515, an increase of 65% or average annual increase of about 1.6% which is very encouraging (Tables 2 and 3 and Figure 3).

Table 2 reviews Bangladesh's progress in each of the HDI

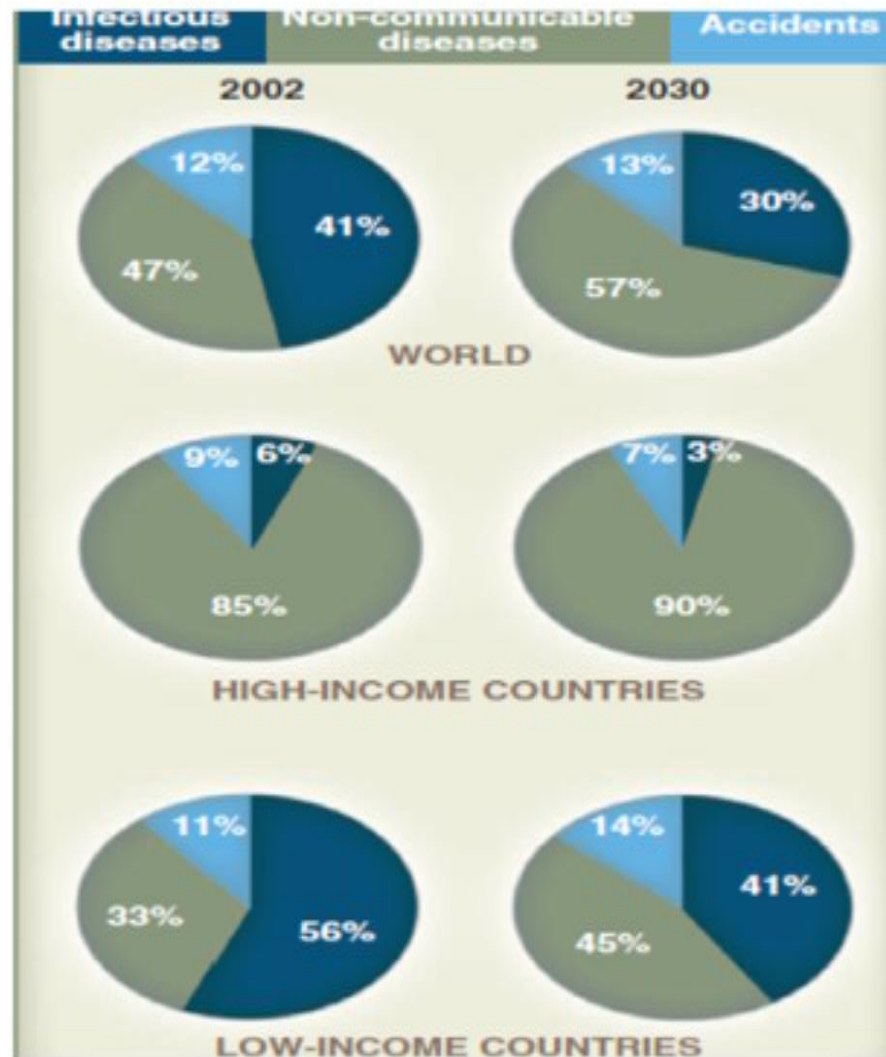


Figure 2. Proportional distribution of disability. The proportional distribution of disability adjusted life years, contributable to infectious diseases and NCDs for (top) the world, (middle) high-income countries, and (bottom) low-income countries for 2002 and 2030 (Mathers and Loncar, 2004).

indicators, based on consistent time series data. In spite of the looming threat of double burden of diseases between 1980 and 2012, Bangladesh’s life expectancy at birth increased by 14.0 years, mean years of schooling increased by 2.8 years and expected years of schooling increased by 3.7 years. Bangladesh’s gross national income (GNI) per capita increased by about 175% between 1980 and 2012. All indicators of Bangladesh show a positive tendency of progress. Table 2 indicates that, with many limitations, it has been able to prosper. The demographic indicators show a decline in death and birth rates and increases in life expectancy (Table 4). The proportional distribution of disability adjusted life years, contributable to infectious diseases and NCDs for the world’s top, middle and high-income countries, and bottom low-income countries for 2002 and 2030 (Mathers and Loncar, 2004) are shown in Figure 3. The demographic indicators also show a decline in death and birth rates and increases in life expectancy (Table 4). The key health indicators of MCH in Bangladesh are very impressive. Comparisons of data of different health indicators available at different times are shown in Table 5. In South Asia households, air pollution from solid fuels are the main

risk factor for disease, where as blood pressure is the main factor East Asia and South East Asia (Table 6). Prevalence of Diabetes in Bangladesh was projected to be 2.2 where as in Bhutan, it was projected to be 2.1 (Table 7).

Statistics

Though Bangladesh is addressing the issue of double burden of diseases in a most formidable manner yet the danger impends as in any other LMICs. A broad prognosis made by World Bank is as follow to elucidate the burden in Bangladesh.

CVD

CVD is estimated to be the main cause in 25.1% of deaths and is projected to be the main cause in 37.2% of deaths in 2030. Ischemic heart disease (IHD) is the leading cause of death and is responsible for 12% of all mortality while cerebrovascular disease (or stroke) is the sixth leading cause of death (in 2005).

Table 4. Basic indicators (UNICEF, 2003).

Variable	Value
Under-5 mortality rank	61
Under-5 mortality rate, 1990	143
Under-5 mortality rate, 2010	48
Infant mortality rate (under 1), 1990	99
Infant mortality rate (under 1), 2010	38
Neonatal mortality rate, 2010	27
Total population (thousands), 2010	148692
Annual no. of births (thousands), 2010	3038
Annual no. of under-5 deaths (thousands), 2010	140
GNI per capita (US\$), 2010	640
Life expectancy at birth (years), 2010	69
Total adult literacy rate (%), 2005-2010*	56
Primary school net enrolment ratio (%), 2007-2009*	89
% share of household income 2000-2010*, lowest 40%	22
% share of household income 2000-2010*, highest 20%	-

The demographic indicators show a decline in death and birth rates and increases in life expectancy.

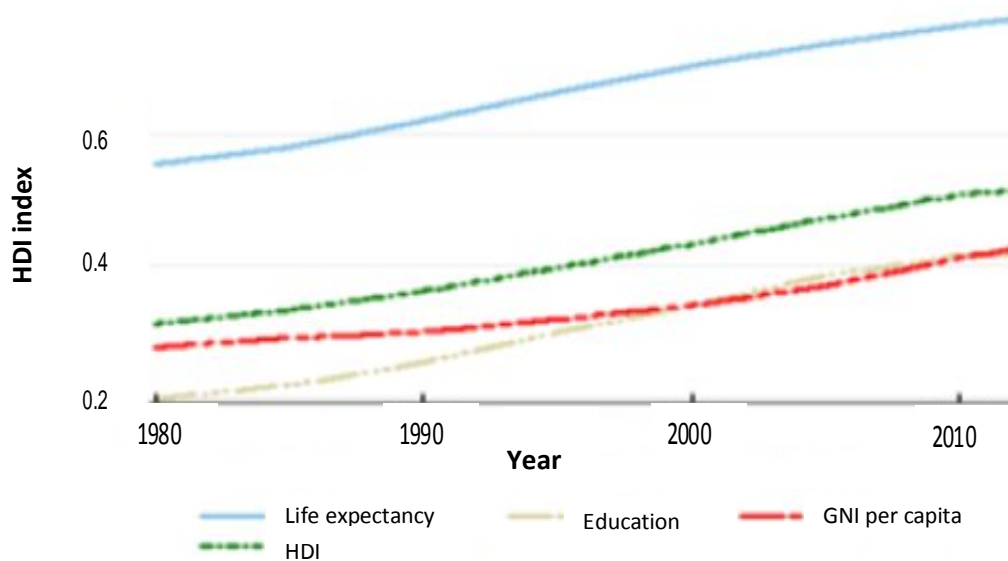


Figure 3. Trends in Bangladesh's HDI component indices 1980-2012 showing the contribution of each component index to Bangladesh's HDI since 1980. Bangladesh being the youngest country in the region is progressing well in the development of HDI (UNDP, 2013).

Diabetes

The prevalence is estimated to be 6.9% (7.5% male and 6.5% female). Urban-area studies find higher prevalence than in rural areas (urban approximately 8 to 10%).

Cancer

Cancer causes 7.5% of deaths; 70.7% of all cancer deaths were among men in 2008. By 2030, cancer deaths are projected to constitute 12.7% of the total. Among men, the leading cancer is

mouth/oropharynx, followed by lung, and then esophagus; for women, mouth/oropharynx cancer is followed by cervical and breast cancer.

Asthma and respiratory diseases

A small national sample estimated 6.9% prevalence of asthma. For those over 30 years, the estimated prevalence of chronic obstructive pulmonary disease (COPD) is about 3%. Nearly 90% of the population use solid fuels, including biomass such as dung and

Table 5. Key health indicators in Bangladesh (World Bank, 2008).

Indicator	Then	Now
Life expectancy	44 (1970)	66 (2008)
Under-5 mortality rate per 1,000 live births	233 (1975)	54 (2008)
Immunization coverage	1% (1980)	89% (2008)
Underweight children under 5	70.5% (1985)	47.8% (2005)
Maternal mortality ratio per 100,000 live births	648 (1986)	322 (2001)
Total fertility rate	7 (1978)	2 (2008)
Contraceptive prevalence	7.7% (1975)	55.8% (2007)
Antenatal care coverage	25.7% (1994)	52.2% (2007)
Births attended by skilled health personnel	9.5% (1991)	24.4% (2009)

The key health indicators of MCH in Bangladesh are very impressive. Comparisons of data of different health indicators which were available at different times.

Table 6. Top five risk factors for disease in five selected regions (Robinson and Hort, 2013).

Australasia	East Asia	South Asia	South- East Asia	Oceania
High body mass index	High blood pressure	Household air pollution from solid fuels	High blood pressure	High fasting plasma glucose
Tobacco smoking including second-hand smoke	Tobacco smoking including second-hand smoke	Tobacco smoking including second-hand smoke	Tobacco smoking including second-hand smoke	High body mass index
High blood pressure	Diet low in fruits	High blood pressure	Household air pollution from solid fuels	Tobacco smoking including second-hand smoke
Alcohol use	Ambient particulate matter pollution	Childhood underweight	Diet low in fruits	Household air pollution from solid fuels
Physical inactivity and low physical activity	Household air pollution from solid fuels	Diet low in fruits	High fasting plasma glucose	Alcohol use

wood or coal for routine cooking and heating. In 2002, the disease burden due to indoor air pollution related to solid fuel caused some 46,000 deaths, of which 13,620 were from COPD and an estimated 32,330 from acute lower respiratory infection in children under the age of 5 years.

Hypertension

Approximately 25% of slum dwelling women and 38% of non-slum women had hypertension compared to 18 and 25% among men, respectively.

Injuries

Road traffic injuries are the most common cause of serious injuries among men (40 to 45% among urban men). The leading cause of injury-related death among children (1 to 17years) is drowning (59.3%) followed by road traffic accidents (12.3%). Among women, 57% reported serious injuries due to domestic accidents, including domestic violence.

Smoking

Prevalence is higher than in other South Asian countries (males 47%, females 4%) while smoking prevalence among youth is similar (boys 9%, girls 5%). More prevalent among the poorest men (70%) (World Bank, 2009). Another study revealed that 98.7% of the population has at least one risk factor, most of which are related to lifestyle. The estimated number of current adult tobacco smokers is 21.9 million (21.2 million males and 0.7 million females). The smoking rate in rural areas is slightly higher (23.6%) than in urban areas (21.3%). Around 27.2% (25.9 million) of the adult population currently use smokeless tobacco. Prevalence is similar in males (26.4%) and females (27.9%). Current smokeless tobacco use is more prevalent in rural areas (28.8%) compared to urban areas (22.5%). Among all adults, 45% were exposed to second-hand smoke in public places. Males were more exposed (69.4%) than females (20.8%). Among all persons engaged in indoor occupations, 63% (11.5 million) were exposed to second hand smoke in indoor areas of the workplace; among nonsmokers, 75.7% (5.1 million) were exposed to second hand smoke at these workplaces. A substantial proportion of gross domestic profit (GDP, 1.4%) is burned out for purchasing cigarette and biri.

Table 7. Prevalence of diabetes in South Asia, 2000 and 2025 (projected in 1998).

Country	2000	2025
Bangladesh	2.2 (1564)	3.1 (4032)
Bhutan	2.1 (19)	2.3 (39)
India	4.0 (22878)	6.0 (57243)
Maldives	2.5 (3.2)	3.0 (9.2)
Nepal	2.2 (263)	2.6 (638)
Pakistan	7.1 (5310)	8.7 (14523)
Sri Lanka	2.6 (318)	3.5 (617)

Values are percentages (number of people with diabetes, 000s) (Abdul-Ghaffar et al., 2004).

Table 8. CVD mortality (Shah Monir Hossain, 2011).

Type of CVD	% among all deaths
Heart attack	2.4
Stroke	3.6
Other CVD	6.5
Total CVD	12.5

The overall daily per capita consumption of fruit was 1.7 servings and of vegetables 2.3 servings against their minimum daily requirement of 5 servings in either form. Considering the cutoff as minimum recommended amount, 95.7% did not consume adequate fruit or vegetables on an average day.

Physical inactivity, particularly among female and urban residence is low. Sedentary lifestyle in urban population is a major risk factor. Prevalence of low level of physical activity is quite high (27%).

Although under nutrition is a major concern in sections of the population, around one fifth (18%) of the adult population were reported to be overweight and this is higher in women (22%). Around 17.9% of the survey population in the Bangladesh, NCD risk factor survey had hypertension. Population data indicated an increasing trend in diabetes prevalence especially in urban areas.

A percentage of documented diabetes of around 3.9% is among people aged >25 years. However, studies that used blood sugar measurement revealed a higher prevalence. In rural adults, the prevalence is about 5%. In urban area the prevalence is just double (10%) (Sheikh and Islam, 2012).

The major NCDs of Bangladesh are diabetes, CVD, hypertension, stroke, chronic respiratory diseases, and cancer (Shah Monir Hossain, 2011). While the national NCD risk factor survey in 2010 is that: 99% of the survey population had at least one NCD risk factor; 29% had 3 risk factors, the message is clear, hardly anyone without a risk factor; and rural inhabitants and urban slum dwellers particularly suffer the most (Shah Monir Hossain, 2011).

In relation to our population and socio-economic conditions, these figures are high but not as yet threatening.

RESULTS

Preliminary finding of Bangladesh Census 2011

The country faces double burden of diseases, both CDs and NCDs. High burden of CDs was historical in a deve-

loping and tropical country like Bangladesh. But, NCD burden is rapidly increasing due to social transition, unhealthy dietary habit and rapid urbanization. In terms of the number of lives lost due to ill-health and disability, NCDs account for 61% of the total disease burden. The under-privileged communities in the country are bearing the heaviest toll of this burden. CVD mortality rate for heart attack is 2.4%, where as for stroke is 3.6% (Shah Monir Hossain, 2011; Table 8).

Communicable diseases (emerging and re-emerging) in Bangladesh

Bangladesh is a densely populated country, where communicable disease burden is significant, and WHO Bangladesh provides technical support in strengthening national capacity for effective management of major communicable diseases such as HIV/AIDS, tuberculosis, malaria, leprosy, pneumonia, diarrhoeal diseases, tuberculosis, measles, and vector-borne diseases, like dengue, visceral leishmaniasis (kala azar), filariasis. An effective surveillance system for major communicable diseases is being established and made operational. Epidemic preparedness and response capacity has been enhanced for outbreak investigations and interventions (WHO, 2010).

However, the situation is under control and steady progress is being made: (1) overall an infectious disease, as a cause of mortality, has declined substantially since 1990, (2) diarrhoeal disease mortality has declined by 90%, but still needs to decrease further, (3) pneumonia mortality has not improved substantially, and needs zinc and vaccine programmes to bring these rates down, and (4) tuberculosis needs to be controlled before HIV/AIDS becomes prevalent.

Over the last several decades Bangladesh has made remarkable progress in reducing the human health burden of infectious disease, especially in children, largely due to reduction in mortality from infectious diseases.

Despite substantial progress, vaccine preventable diseases remain important causes of ill health and premature death in Bangladesh. The recent national demographic and health survey shows 62% of deaths among children under the age of 5 years were attributed to infectious diseases. This accounts for 55 deaths per 1000 live births.

Drug-resistant infectious diseases will continue to strain resources and threaten existing methods for effective therapy. In some cases like measles, affordable vaccines are available but under-utilized while diseases like Haemophilus influenzae type B (Hib), hepatitis B, typhoid, and pneumococcal diseases for which safe and effective vaccines exist, but cost is a barrier to their introduction, acceptance, and use (ICDDR, 2013).

Very recently, there has been a Chikungunya outbreak in Bangladesh. It poses a big threat and likely to emerge in Bangladesh as a major public health problem. These

emerging and reemerging infectious diseases are superimposed on a substantial baseline of established infectious diseases (Kahhar, 2012).

DISCUSSION

A host of factors relating to community, economic, ecological and physical conditions significantly affect the health profile of a society. Evidence shows that enhanced water and sanitation, education, largely of women and girls, and additional equitable access to healthcare services can substantially cause improvements in the overall health sector. Furthermore, equitable revenue distribution reduces lack of communication. Many of the factors may encompass an impact on each addition, leading to multiplier effects. Some of these factors are in turn worsened through ill health, leading to a nasty cycle (Financial Express, 2012).

The double burden of diseases is high in South Asia, though there are differences among countries and within urban and rural areas of each country, depending on the level of developmental and epidemiological transition. Many of these disease burdens occur in the productive mid-life period and will, therefore, adversely affect workforce productivity and economic development. Although the absence of well established disease surveillance mechanisms prevents precise estimation of the size of NCD burdens, the direction of change is clear, that is, the burden is rising. More accurate estimation of these burdens, their risk factors, and time trends would help to better inform policy and to monitor change in response to public health interventions. Even at the current state of knowledge, however, the magnitude of the problem is large enough to demand urgent attention and action (Abul-Ghaffar, 2004).

The high levels of maternal BMI >23 are consistent with nationally-representative data of the Bangladesh Demographic Health Survey (BDHS), which have also demonstrated significant levels of maternal over-weight. This double burden of disease (concomitant existence of high levels of under and over nutrition) in the Integrated Nutrition Project (INP) areas needs to be addressed by Plan Bangladesh in the form of healthful diet and lifestyle promotion alongside existing under-nutrition interventions (Talukder et al., 2006).

The demographic transition in the world has given rise to epidemiological transition which in its fifth phases has led the different countries to face the challenge of having to deal with double burden of infectious and NCDs. The developed countries have already entered the fifth phase of this transition but the middle and low income countries due to financial and social constraints are yet to stabilize their positions in this transitional process.

Bangladesh is in the midst of an epidemiologic transition. The disease pattern is shifting from a profile dominated by infectious diseases, under-nutrition and conditions of childbirth to one increasingly characterized

by NCDs. The effects of this double burden of diseases in Bangladesh are not yet readily felt but prognosis indicates that as the country progresses and life style of people change, the effects could be severe. However, as of now the progresses made by Bangladesh in different sectors of health and MCH is very impressive despite resource scarcity and climatic conditions.

A few key converging factors have contributed to these achievements. The government of Bangladesh has shown policy continuity and commitment to improving health conditions, placing particular emphasis on improving the health conditions of its citizens and targeting the poor, women and children. Innovative practices and approaches for targeting and empowering the most vulnerable, together with effective partnerships with non-governmental organizations (NGO) have contributed to these successes. NGOs have also played a key role in developing novel approaches and practices as well as in delivering services to hard-to-reach groups.

Donor assistance has also been critical to the development of Bangladesh generally and the health sector in particular. Underlying these factors is a strong sense of social contract and social solidarity, to which the spirit of cultural homogeneity contributed (Sheikh and Islam, 2012). There is a need for the global and national actions set out in the political declaration of the 2011 high level meeting on NCDs. The likely agreement of member states on a framework of indicators and targets for monitoring the progress of NCDs at the World Health Assembly in May 2013 is another indicator of progress in the right direction. Health sector reform needs to go hand in hand with other changes for policy makers. The kind of multi-sectoral approaches required to control NCDs effectively need to be forged by health policy makers. The recent WHO strategy 'Changing Mindsets' calls for greater collaboration between researchers and policy makers to drive health system transformation and strengthening. In a post-2015 environment, however, health priorities will need to change. The role of NCDs, particularly their contribution to increasing the demand for health services and changing the nature of that demand, will be dramatic (Robinson and Hort, 2013).

Conclusion

As the double burden grows, ensuring that health systems can adequately address non-communicable diseases (along with communicable diseases) becomes integral to augmenting the capacity of health systems to meet evolving health challenges. Health service delivery needs to adapt to transition from a predominantly acute care model to one that balances prevention with disease management and palliative care. For this to occur, integrating NCD prevention and management into primary health care is essential (Sheikh and Islam, 2012). An integrated communicable disease surveillance system for both communicable and non-communicable diseases

needs to be initiated. Some succinct recommendations are as follows: (1) government should build capacity of the public, private and NGO health service providers, (2) government should establish a NCD referral chain from the community level to district level through community clinics, sub centers, UHFWC, UHC and private health facilities, (3) government should create a coordination mechanism among public, private and NGOs, (4) government should set up an advocacy network at national level to community, (5) government should level to update and create policies for health and other related sectors to reduce risk factors of NCDs, (6) government should educate community people to be aware of NCDs for prevention and early diagnosis, and government should establish an electronic database system (Shah Monir Hossain, 2011).

In spite of such a fast growing private sector, Bangladesh does not have a comprehensive health policy with a vision for the totality of the health sector. As a steward for the health system, the Ministry of Health and Family Welfare is yet to come up with an overarching strategic direction for the health sector as a whole encompassing both the public and the private sector.

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Full Length Research Paper

Experience of HIV-related stigma by people living with HIV/AIDS (PLWHA), based on gender: A case of PLWHA attending clinic in the Federal Medical Center, Owerri, Imo states, Nigeria

Nworuh Okwuchi Blessed¹ and Anthony Ikechukwu Ogbalu²

¹Department of Public Health Technology, Federal University of Technology, Owerri, Nigeria.

²Department of Human Kinetics and Health Education, Nnamdi Azikiwe University, Awka, Nigeria.

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Stigma is a discrediting social label that changes the way an individual looks at himself and disqualifies him from full social acceptance. Related researches show that HIV-related stigma is universal, but the stigma experiences vary from person to person. This paper identified four forms of stigma experience (internalized stigma, disclosure stigma, public attitude stigma and negative self image stigma); and measured them among people living with HIV/AIDS (PLWHA) based on gender. With a purposive sample of 1,552 HIV-positive persons comprising of PLWHA that attended clinic on the four clinic days and willingly completed and returned the questionnaire within the one month of collecting data. 626 of them, representing 40.3% were males while 926 representing 59.7% were females. A 40 item standard Berger-Stigma survey questionnaire was used. Data collected were scored and analyzed using t-test to get the mean score of stigma experience for each form of stigma at 5% level of significance. The male and female PLWHA experience the four forms of stigma (107.32 stigma mean score for females and 101.46 stigma mean score for males); but the females have higher mean scores of stigma experience than males in internalized stigma, disclosure and negative self image. Hence, there is a significant difference in stigma experience of PLWHA based on gender. Recommendations include gender sensitive anti-stigma programme, formation of female HIV-support groups, government policy to protect the rights of HIV positive women.

Key words: Stigma, forms, experience, gender.

INTRODUCTION

A dictionary definition of stigma is a disgrace or a reproach attached to something. Stigma is often described as the negative labels or stereotypes used when talking about something or somebody. According to Lichtenstein (2003), stigma is a discrediting social label that changes the way an individual looks at himself/herself and disqualifies them from full social acceptance.

The first three components of stigma was proposed by Link and Phelan (2006) with items related to labeling, devaluing and isolation of people living with HIV/AIDS (PLWHA), but also encompasses items on the shame of PLWHA, blame for the responsibility for HIV infection on the HIV-positive individual and positive and negative feelings about PLWHA. This also incorporates attitudes regarding the isolation of individuals with HIV/AIDS and

their families within the community and by employers. These three components by Link and Phelan (2006) are internalized stigma, disclosure stigma and negative image stigma. In another study, Berger (2001) quoted in UNAIDS (2008), conducted a psychometric assessment of a HIV stigma scale and four factors or forms of stigma emerged: personalized or internalized stigma, disclosure concerns, negative self-image and concerns with public attitudes, towards people living with HIV infection.

Berger's stigma scale questionnaire based on the four forms of stigma is reported to have good construct validity and internally consistent reliabilities with coefficient alphas between 90 and 93 for each of the forms (also called subscales) and 96 for the 40 item measures (USAID, 2008). Lichtenstein (2003) and Bunn et al., (2007) identified the same four forms of stigma, but described them as four domains of stigma experiences.

Personalized/Internalized HIV-related stigma experience is the stigma effects on the PLWHA; as it is internalized into their self-perception and sense of identity, impacting on the person's perceptions and how they interact in the world. Research has found that people with HIV feel isolated, guilty, dirty and full of shame. This is often incorporated into identity (NACA, 2004).

Disclosure stigma experience is related to the concern to control information, keeping one's HIV status secret, or worrying that those who know about the HIV status will tell others. Disclosure concern form of stigma is described by UNAIDS (2006) as a form of stigma that drives HIV out of the public sight, so reducing the pressure for behaviors change. This form of stigma also introduces a desire not to know one's own status, thus delaying testing and access to treatment.

According to Spiegel (2004) disclosure related stigma experiences counter acts trust. This often leaves those infected alone and distanced from the rest of their communities, colleagues and even family. Disclosure stigma experience has been described by Shapiro (2003) to be capable of increasing the risk of infection for the sexual partner of HIV-positive person.

Public attitude stigma experience is a form of stigma experience that refers to what most people think about a person with HIV or what 'most people' with HIV can expect when others learn they have HIV infection (Berger, 2007). Denying the rights of people with HIV/AIDS limits their ability to care for themselves and their families and makes them more vulnerable to infection and susceptible to stigma. Paxton (2005) talking about people's attitudes, described stigmatization as cruel social processes that offer some feeling of protection to the powerful, while increasing the load on the individual or group who is victimized in the process. Religious groups may intentionally or inadvertently contribute to stigmatizing PLWHA by making explicit or implicit judgements against those who are infected with HIV. Leclerc-Madlala (2002) opined that the attachment

of gender discrimination to HIV stigma has led to women being blamed for spreading the epidemic. Thus women are contradictorily expected to provide sexual services to men generally, be chaste and pure and take on the responsibility of preventing disease. Talking about the experiences of stigma related to peoples attitude, Parker and Aggleton (2002) stated that there are many examples at a national level of stigmatization and also discrimination that is introduced by socially conservative governments, including policies of restriction of admission, deportation of foreigners, mandatory testing for those seeking work permits or tourist visas.

Negative self-image refers to feeling unclean, not as good as others or bad as a person, because of being HIV-infected (Lichtenstein, 2003). HIV stigma comes from the powerful combination of shame and fear. Shame because sex being a source of transmission, is surrounded by taboo and moral judgment; fear because AIDS is relatively fearful and deadly. The only way of making progress against the epidemic is to replace shame with solidarity and fear with hope (Bunn et al., 2007).

According to Ajuwon (2011), aside from the news or media reporting, the experiences of stigma faced by HIV and AIDS persons in Nigeria have not really been properly investigated through scientific researches. The HIV and AIDS related (published) studies done in Nigeria mainly focused on knowledge, prevalence and reviews on discriminations. It is pertinent therefore to identify and measure the experience of stigma by male and female persons living with HIV and AIDS, this will help for articulated and properly directed intervention.

Purpose of the study

This study specifically assessed the experience of HIV-related stigma on PLWHA based on their gender.

Research questions

How is the stigma experience of PLWHA based on their gender? Is the experience of HIV-related stigma same for both male and female plwha in all forms of stigma?

Hypothesis

There is no significant difference in the stigma experience of people living with HIV and AIDS based on their gender.

METHODOLOGY

This is a descriptive survey that identified and measured the stigma experience of male and female PLWHA that were attending clinic at the federal medical center, Owerri. Purposive sampling technique

Table 1. t-Test analysis result for difference in mean score for various forms of stigma experienced by male and female PLWHA.

Stigma domain	Gender	N	Mean	Standard deviation	Standard error	t-Test value	P-value
Experiences of personalized stigma	Male	626	32.90	7.395	0.296	143.030	0.000
	Female	926	37.05	6.217	0.204		
	Total	1552	35.38	7.018	0.178		
Disclosure stigma experience	Male	626	23.25	5.915	0.236	6.708	0.010
	Female	926	24.03	5.748	0.189		
	Total	1552	23.71	5.827	0.148		
Public attitude stigma experience	Male	626	25.73	7.405	0.296	0.555	0.456
	Female	926	25.46	6.694	0.220		
	Total	1552	25.57	6.988	0.177		
Negative self image stigma experience	Male	626	19.59	5.886	0.235	16.727	0.000
	Female	926	20.78	5.432	0.179		
	Total	1552	20.30	5.648	0.143		
Total stigma combined	Male	626	101.46	18.260	0.730	48.746	0.000
	Female	926	107.32	14.663	0.482		
	Total	1552	104.96	16.457	0.418		

was used considering the peculiar characteristics of PLWHA. Subjects comprised of PLWHA that attended clinic on any of the four clinic days and were willing to fill out the questionnaire within one month of data collection for this research (a clinic day is one day in a week for free testing, counseling and distribution of anti retroviral drugs). Data was collected using Berger's stigma survey questionnaire (2001), containing 40 question items for the four forms of stigma experience. The questionnaire was distributed to the subjects and collected same day in each of the four clinic days, with the assistance of the counselor working in the HIV unit of the hospital. Subjects indicated their opinion on a scale of: 1 [strongly disagree] to 4 [strongly agree]. The least score in all the scales would be 40 (1 multiply by 40 items); while the highest score would be 160 (4 multiply by 40 items). Each subscale, that is, the scale used to measure one form of stigma experience was calculated by simply adding the values of the items belonging to that subscale. The higher scores on any of the forms/subscale were indicative of increase in the experience of stigma.

Data analysis

Gender related experience of stigma was tested with t-test statistic to find out if there was a statistically significant difference in the HIV-related stigma experience of male and female persons living with HIV and AIDS. The mean scores of each of the four forms of stigma experience were also determined based on the gender of the subjects. Finally, the statistical significance of the subjects' stigma experience in relation to their gender was determined at 5% level of significance Table 1.

RESULTS

For experience of personalized stigma

There is a difference in the mean score of stigma

experienced by male and female PLWHA. Females experience more personalized stigma (mean score=37.05) when compared with male subjects (mean score=32.09) at 5% level of significance.

For disclosure stigma experience

There is a difference in the mean score of stigma experienced by male and female PLWHA. Females experience more disclosure concern stigma (mean score=24.03) when compared with male patients (mean score=23.25) at 5% level of significance.

For public attitude stigma experience

There is no difference in the mean score of stigma experienced by male and female patients. Males experience relatively same public attitude concern stigma (mean score=25.73) when compared with female patients (mean score=25.46) at 5% level of significance.

For negative self image stigma experience

There is a difference in the mean score of stigma experienced by male and female. Females experience more negative self image (mean score=20.78) when compared with male patients (mean score=19.59) at 5% level of significance.

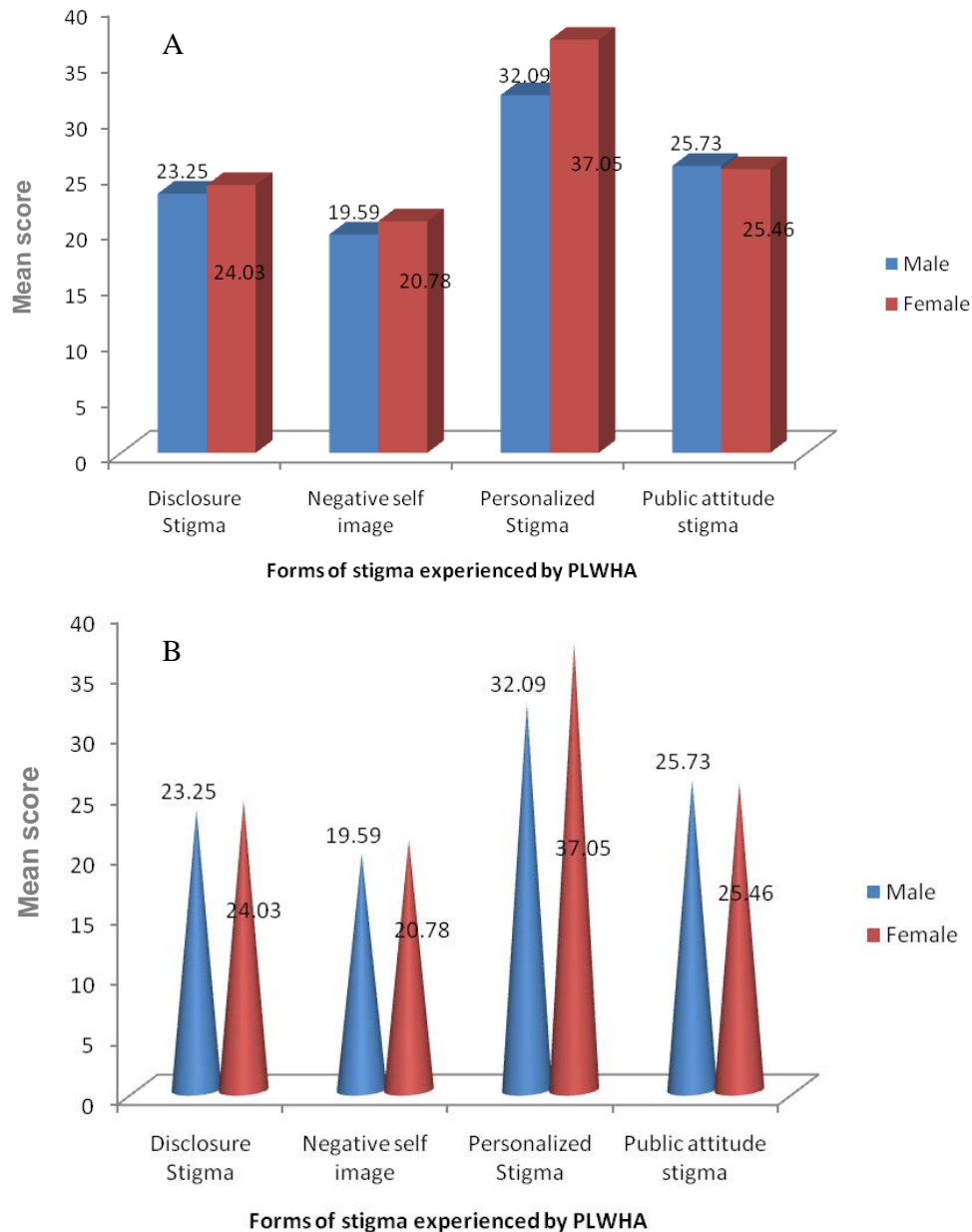


Figure 1. Mean score of forms of stigma experienced by PLWHA

For total stigma experienced

There is a difference in the mean score of overall stigma experienced by male and female PLWHA. Females experience more stigma (mean score=107.32) when compared with male patients (mean score=101.46) at 5% level of significance Figure 1.

DISCUSSION

The sample for this study comprised of 1,552 HIV-positive persons; females 926 (59.7%), and males 626

(40.35%). The female PLWHA had a consistent higher mean score of stigma experience in three forms of stigma than the males. This could be because HIV and AIDS-related stigma often build upon and reinforces other existing prejudices, such as those related to gender (Paxton, 2005). Also, women may suffer more stigmas, because women with HIV and AIDS are viewed as having been promiscuous, despite evidence to suggest that in the majority of cases, they acquired the infection from their husbands or male partners.

The media images of HIV and AIDS as a woman's disease, reinforces the stigma on women and plays into existing social inequality that make women inferior to

men. According to Paxton (2005) within the family and the community, women are significantly more likely to experience personalized stigma than men, including ridicule and harassment, physical assault and being forced out of their homes. Women are often more conscious of their self identity and desire social acceptance more than men; on this note, most women with HIV may think that their identity and self worth have been damaged. Russell (2005) stated that blame is often assigned to black people and women, thereby exposing women to more stigma experience than men. Men also blame women for infecting them and also spreading the virus.

Conclusively, male and female PLWHA experience the four forms of stigma which include personalized [internal] stigma [stigma related to ones identity and self worth because of HIV], disclosure concern [this is stigma related to disclosure of HIV status], public attitude concern [stigma related to attitude of people towards a HIV positive person], and negative self image [stigma related to ones feeling of guilt-and ashamed because of his/her HIV status].

The implication of the aforementioned finding and results is that both male and female PLWHA are heavily burdened with different forms of stigma experience due to HIV. This will demand an articulate selection of enlightenment, inspirational and empowerment programme that will be embracing enough to cut across gender.

Since gender is statistically significant to stigma experience, measures that will be adopted will take into consideration the make-up and psychology of the female gender. This could also mean that the complications associated with HIV will be obvious on the females, especially pre-natal and post-natal females.

RECOMMENDATIONS

Ensuring legal and policy protections for female HIV-positive persons is essential to reduce the HIV-related stigma experienced by females. A careful development of gender centered and sensitive anti HIV stigma programme will certainly help. In such, gender selective programme relationship is enhanced, experiences are shared and females will be supported by other females. Communities should actively participate in anti-stigma programmes specially supported by the community leaders.

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Full Length Research Paper

Cryptosporidiosis among children in some rural parts of Imo state, Nigeria

Nkem Benjamin^{1*}, Chukwuocha Uchekukwu², Dozie Ikechukwu², Amajuoyi Oliver³ and Nwokeji Muodebe⁴

¹ Medical Research Unit, Federal Medical Centre Owerri, Nigeria.

² Department of Public Health Technology, Federal University of Technology Owerri, Nigeria.

³ Chemical Pathology Department, Federal Medical Centre, Owerri, Nigeria.

⁴ Histopathology Department, Federal Medical Centre Owerri, Nigeria.

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The public health importance of cryptosporidiosis has not been widely reported among rural children in Imo State, South Eastern Nigeria. The prevalence of cryptosporidiosis among children was assessed in some rural parts of Imo State, Nigeria between November 2006 and October 2007 using standard parasitological techniques. Stool specimens from consenting subjects accessing primary health care facilities in the area were prepared using formalin/ether concentration methods, stained with modified acid fast stain and examined microscopically for oocyst of *Cryptosporidium parvum*. The overall prevalence of 14.3% was recorded. No oocysts were identified in asymptomatic control group (n=20). More male children (15.4%) were infected than female (13.4%) ($p<0.05$). The highest prevalence (20.3%) was noted among children within the age group of 0 to 5 years, while those within the age group of 11 to 14 years yielded the least prevalence (11.5%). Prevalence decreased as age increased ($p<0.05$). More so, infection was more prevalent among children in primary schools (16.4%) followed by those in daycare centres (14.5%), while those in post primary schools yielded the least (6.7%) prevalence. Prevalence rates of 13.4 and 13.9% were recorded for children at home (not enrolled into school) and nursery schools, respectively. There was significant difference as regards school related prevalence rates ($p<0.05$). The present results show that cryptosporidiosis poses a public health challenge in children found in the rural parts of Imo State, Nigeria, though it has not attained epidemic proportion. This warrants intensified effort towards awareness of the disease and its public health significance as well as prevention and control strategies in the area.

Key words: Cryptosporidiosis, widely reported, rural children.

INTRODUCTION

Cryptosporidiosis is a parasitic disease caused by an ampicomplexan protozoon of the genus *Cryptosporidium*. In humans, the specific infective agent is *Cryptosporidium parvum*. The disease affects the microvillus regions of epithelial cells lining the respiratory and digestive organs of vertebrates (Fayer and Ungar, 1986; O'Dongue, 1995). Cryptosporidiosis is acute but self limiting in immuno-

competent individuals generally abating within 8 to 10 days (Fayer and Ungar, 1986; Juranek, 1995). Conversely, the illness may manifest as gastrointestinal infection and eventually results to death in immuno-compromised individuals. Potential sources of infection include pets and farm animals, association with individuals already infected, contaminated foods and

*Corresponding author. E-mail: ifyben4me@yahoo.com.

water while transmission is via fecal-oral route. *C. parvum* being the specific infective agent has also been noted as an important etiologic agent of diarrhoea especially in young children (Mbanugo and Agu, 2006). It is the only coccidian parasite known to infect man (Curds, 1992). First identified in laboratory mice early in the last century, it was considered unimportant and virtually ignored for the next 60 years. The first human case of cryptosporidiosis was reported by Meisel et al. (1976), but the awareness of the public health importance of the organism came to the fore in 1980s, partly due to its association with HIV/AIDS infected individuals.

Numerous outbreaks of cryptosporidiosis have been reported among children in day-care centres (Alpert et al., 1984). Similarly, outbreak traceable to contaminated water has also been reported (Current, 1999). In Nigeria, public health importance of cryptosporidiosis has not been widely reported. It is true that several studies have been carried out focusing on the prevalence and epidemiology of the disease in some parts of the country (Okafor and Okunji, 1994, 1996; Nwabuisi, 2001; Njoku, 2003; Banwart et al., 2003; Mbanugo and Agu, 2006; Dozie et al., 2011), yet these reports are not enough for a detailed understanding of the epidemiological profile of the disease among children in southeastern part of Nigeria, hence the present study, which was designed to fill this gap especially in Imo State. It is expected that the outcome of this study will be useful in appreciating the public health implications of the disease especially among children in the area. It will also provide baseline information on prevention and control strategies especially among children.

METHODOLOGY

Study area

This cross-sectional study was carried out between November 2006 and October 2007 in some rural parts of Imo State, Nigeria. Imo State which is located in South Eastern Nigeria lies between latitude 5 10' and 5 51' North, longitude 6 35' and 7 28' east and comprises 27 local government areas with a total land mass area of 5,289.49 km² and a total population of 3,928,634 (Imo State Statistical Year Book, 2011). The mean annual rainfall is between 1800 and 2500 mm per year while the average relative humidity is about 74%. Farming is a predominant occupation among the rural dwellers. Three primary health care facilities from each of the three senatorial zones (Owerri, Orlu and Okigwe) making up the state were enlisted as the study sites. These facilities were selected because they serve primary health purposes and are therefore a good contact point for symptomatic patients required for this study.

The sources of drinking water in the study area include streams, ponds (mostly in dry season), boreholes and sachet water. Pipe borne water supply was unavailable in the area. General sewage disposal in the area and environmental sanitation favours transmission of infectious pathogens. Animal to person contact takes place, as many residents have pets and other domestic animals. In some cases faecal materials inadvertently contaminate sources of drinking water. Furthermore, the use of bush/grassland near human habitation for such purposes as defecation is common. Sometimes children are forced by circumstances to defecate in nearby vegetable gardens which serve as sources of food. Pit

latrines were also used for defecation in this area.

Participants and specimens

A total of 400 children (3 months to 14 years) comprising of 162 (40.5%) males and 238 (59.5%) females of different age groups who presented with diarrhoea and/or abdominal pains at the selected primary health facilities between November 2006 and October 2007 participated in the study. The samples collected for the investigation included diarrhoeic stool samples. At these same health facilities, 20 control patients with normal stools and without abdominal pain were also recruited and specimens were also collected from them. This control group was of the same age group (3 months to 14 years) with the study participants and from the same geographical location with the study group.

Sample collection

Fresh stool samples uncontaminated with urine were collected from the participants for examination. The specimens were collected using a dry sterile leak-proof plastic ice packed containers, washed free of traces of antiseptics and disinfectants. About 25 g of solid stool or 10 g of diarrhoeal stool was collected from each subject using specimen bottles containing 10% buffered formalin and/or storage medium containing aqueous potassium dichromate (2.5% w/v final concentration). The specimens were transported to the laboratory after collection and processed within 48 h.

Adequate precaution was taken by preserving the specimen in 10% buffered formalin (SAF) to render the oocysts nonviable, because the oocyst of *Cryptosporidium* species in stool specimens (fresh storage media) remain infective for extended periods of time. In addition, the usual safety measures (wearing of hand gloves, avoiding oral contact) for handling potentially infectious materials were adopted.

Macroscopic examination

The samples were examined macroscopically to note their colour, consistency (whether formed, soft or watery), presence of blood or mucus, and if blood was present, whether it was mixed with the faeces and whether the specimen contained adult worms.

Specimen processing and staining of smears

Stool specimens were concentrated prior to staining and microscopic examination in order to maximize oocyst recovery. Formalin-ethyl acetate sedimentation technique was the stool concentration method used (Ukaga et al., 2002). A drop of the deposit from the concentration technique was placed on a glass slide, air-dried, fixed with alcohol and stained with modified acid-fast staining and examined under the microscope using oil immersion objective. Oocyst of *C. parvum* if present appears as red round bodies against a blue-green background.

Data collection

Demographic, behavioral and environmental data was collected using researcher administered questionnaires.

Ethical consideration

The Institutional Review Board (IRB) of Imo State University Owerri

Table 1. Gender related prevalence of cryptosporidiosis among the population studied.

Gender	N	n	Prevalence (%)
Male	162	25	15.4
Female	238	32	13.4
Total	400	57	14.3

N=number examined, n=number infected.

Table 2. Age related prevalence of cryptosporidiosis among the population studied.

Age	N	n	Prevalence (%)
3 Months-5 years	59	12	20.3
6-10 years	202	29	14.4
11-14 years	139	16	11.5
Total	400	57	14.3

N=number examined, n=number infected.

Table 3. School related prevalence of cryptosporidiosis among the population studied.

Level of education	N	n	Prevalence (%)
Home(not enrolled)	67	9	13.4
Daycare	76	11	14.5
Nursery	93	13	13.9
Primary	134	22	16.4
Postprimary	30	2	6.7
Total	400	57	14.3

N=number examined, n=number infected.

reviewed and approved this study. Informed consent was obtained from the parents/guardians of all study participants after the objectives of the study were explained to them.

Statistical analysis

The data obtained from the study were analyzed using Chi-square test statistics. The level of significance was fixed at 0.05.

RESULTS

Of the 400 symptomatic study patients, 57 (14.3%) were infected with oocyst of *C. parvum*. Conversely, the symptom-free control group of 20 children yielded no oocyst. More male children were infected than their female counterparts (15.4% versus 13.4%), though there was no significant difference ($p < 0.05$) (Table 1).

Age group of 0 to 5 years yielded the highest (20.3%) prevalence of oocyst followed by age group of 6 to 10 years (14.4%), with the lowest prevalence (11.5%) noted

for children in the 11 to 14 years age group. Statistical difference exist between the prevalence rates among the three age groups ($p < 0.05$) (Table 2).

Table 3 shows school related prevalence of the infection. Those in primary school yielded the highest prevalence (16.4%), while those in post primary yielded the lowest (6.7%) prevalence. Children at home, nursery school, and day-care centre recorded 13.4, 13.9 and 14.5% prevalence, respectively ($p < 0.05$).

DISCUSSION

The result of this study shows that cryptosporidiosis is present among children in rural communities of Imo State, Nigeria and is of public health significance though epidemic proportion has not been recorded in this area. Previous researcher in this area (Njoku, 2003) reported a prevalence of 5.2% among residents of Owerri and its environs though his study was restricted within a part of the state and did not focus on children alone. The present study which focused on children in the entire state recorded a higher prevalence among children thereby corroborating the report of Mbango and Agu (2006) who reported a prevalence of 14.0% among children of ages 3 months to 15 years in Anambara State, South Eastern Nigeria. This contrasts the result of Dozie et al. (2011) who reported a total prevalence of 19.9% among children and adult population in the area. Another researcher (Nchito, 1998) has also reported a higher prevalence of 18.0% among children in Luzata, Zambia. The present result therefore depicts that the disease is gradually gaining health importance in this area. This may be attributed to poor awareness of the disease and its mode of transmission coupled with rural nature of majority of the parts of the area and the associated human habits that favour fecal-oral transmission of the pathogen. For instance, systematic observation during the study revealed that most of the children, especially in the rural communities pick and eat fallen fruits like mango without washing. They also tend to play outdoors more often thereby predisposing themselves to contaminated foods and soil. Furthermore, the public health significance of cryptosporidiosis has equally been reported in this area (Dozie et al., 2011) and other parts of the world (Fayer and Ungar, 1986; Rose, 1990; Juranek, 1995).

Although no significant difference was noted in sex related prevalence of infection, the observed prevalence of 15.4 and 13.4% among male and female supports the results of Mbanugo and Agu (2006) who reported that more males were infected than females in a prevalence study among children of ages 3 months to 15 years in Anambara State, South Eastern Nigeria. This result therefore shows that human factors that predispose humans especially children, to infection in this part of the world is not a function of gender as noted by previous researchers (Okafor and Okunji, 1996; Chukwuocha et al., 2009; Dozie et al., 2011). In this area, some human

habits as noted among children are similar in both sexes. Key informant discussion and systematic observation revealed that hand hygiene is poor among children in this area mostly at play grounds and schools when they are not within the reach of their guardians. During this outdoor lifestyle, they are inadvertently exposed to contaminated food and water that favour fecal-oral transmission of the pathogen. This finding corroborates a report by the centre for disease control and prevention (CDC, 1996) which underscored the role of contaminated water in some outbreaks of cryptosporidiosis in the United States of America.

Prevalence of cryptosporidiosis according to age group of children revealed that infection was most among children within the age group of 3 months to 5 years followed by age group of 6 to 10 years, while those within 11 to 14 years age group yielded the least prevalence. Statistical difference was recorded among the various prevalence rates. Prevalence rate declined as age increased. This suggests that the relationship between age and immunity is linear in children rather than u-shaped. More so, older children tend to have improved knowledge, attitude and practice vis-a-vis disease transmission than the younger children. For instance, hand to mouth attitude is predominant among the age group of 3 months to 5 years and may be correlated with high prevalence recorded for this age group. This result depicts that, as children grow in age, they acquire knowledge which leads to change of attitude and practice, hence the least prevalence rate (11.4%) recorded for the age group of 11 to 14 years. Immature immunity in the younger age group and degenerating immunity in the older age group has been reported by previous researchers in this area (Dozie et al., 2011).

This study established varied prevalence rates for children at home (not enrolled into school), nursery, primary, daycare and post primary schools, respectively. *C. parvum* infection varied significantly according to level of education of the children examined for oocyst. This finding supports the earlier report of previous researchers (Mbanugo and Agu, 2006; Dozie et al., 2011) who also obtained varied prevalence rates in all diarrhoea cases among children in various levels of education. The highest prevalence of *C. parvum* infection recorded for primary school children may be attributed to the fact that chances of exposure to the pathogen is high among primary school age children since this population tend to play outdoors most, especially at school play grounds (Dozie et al., 2011). Systematic observation and key informant discussion revealed that teachers especially in rural areas do send school children to cultivate in farm lands thereby exposing them to contaminated soil. Most of the school children are house helps who are always under duress to do unhygienic house chores that have the potential of spreading oocyst of *C. parvum* and other pathogens. Since farming is a predominant occupation in these rural settings, school children also accompany their

parents to farm lands where they inadvertently get infected via contaminated soil and nearby contaminated ponds and streams which they are forced by circumstance to drink from. It was further observed systematically that these streams and ponds are prone to contamination by agricultural runoff from grazing lands. By this, they acquire the potential to propagate oocysts. More so, children imitate and aid in house chores including cleaning of the toilets which in rural areas are pit latrines, thereby exposing themselves to infectious oocyst (Dozie et al., 2001). Similarly, prevalence of 14.5% recorded among children in daycare centres also shows that daycare centre is significant in disseminating the oocyst of *C. parvum*. This could be attributed to playing and eating habits of the children and poor hygienic practices adopted by some caregivers. This contrasts the result of Mbanugo and Agu (2006) who in their study reported that children sampled from daycare centres yielded the highest prevalence than other groups. No significant difference exists between the prevalence rates of children in nursery school and those who have not been enrolled; probably they have common attitude and practice. The least prevalence recorded among post primary school children might be attributed to improved knowledge which in turn results to the right attitude and practice. Other researchers have noted that children are reservoirs for parasitic infections and therefore are important in perpetuating their transmission (Ejezie, 1981). The result of the present study therefore shows that primary school children living in Imo state are often exposed to pathogens due to their living conditions and that the right attitude and practice expected for prevention and control of infectious diseases are lacking in most of the children.

Absence of *C. parvum* oocyst in the stool samples of 20 control respondents probably indicates that *C. parvum* could be strongly implicated in the incidence of diarrhoea in children, because the infected stools were mostly diarrhoea stools while non-infected stools were non-diarrhoea stools. Similarly, previous researchers have reported high oocyst recovery in watery and semi formed stool samples (Okafor and Okunji, 1994; Mbanugo and Agu, 2006; Dozie et al., 2011).

Summarily, the results of this study depict that cryptosporidiosis is prevalent among children in this local population and therefore could pose a public health challenge to the populace. Thus, prompt intervention geared towards adopting adequate preventive and control strategies is necessitated in this part of the world. Researchers in this area should intensify effort in studying this organism and also diversify the scope of their study design vis-à-vis the public health significance. The findings of this study will help government, non-governmental organizations and other policy makers including stakeholders to articulate and adopt strategies aimed at preventing outbreak of the disease especially among children in the area. It will also help parents, teachers and caregivers to improve on human habits that

favour transmission of the pathogen. It is recommended that parents should start on time to enlighten their children on hand hygiene, domestic sanitation and health education so as to minimize fecal-oral contact inherent among children. Improved water supply should also be ensured at homes, schools and daycare centres. Caregivers should ensure proper hand washing while attending to children in daycare centres.

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Full Length Research Paper

Determinants of long lasting insecticidal nets distribution, ownership and use in the Federal Capital Territory, Nigeria – implications for malaria programmes

Olapeju Otsemobor¹, Oluremi O. Ajayi¹, Bamgboye M. Afolabi^{2*}, Jerry A. Ajayi¹, Longtong G. Turshak³, Bayo S. Fatunmbi⁴ and Saminu Sani⁵

¹Department of Zoology, Parasitology Unit, University of Jos, Plateau State, Nigeria.

²Health, Environment and Development Foundation, 34 Montgomery Road, Yaba, Lagos, Nigeria.

³Department of Science Laboratory Technology, University of Jos, Plateau State, Nigeria

⁴WHO Regional Office for the Western Pacific, Manila, Philippines.

⁵Department of Health Federal Capital Territory, Abuja, Nigeria.

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A community-based household survey was conducted to investigate the ownership and utilization of malaria control commodities in the Federal Capital Territory (FCT), Nigeria, using a multifaceted four-phase operational research. The main objectives were to investigate access to and utilization of health services in the capital of the country, to evaluate Insecticide-treated nets (ITN)/long lasting insecticidal nets (LLIN) household coverage including ownership and usage and to assess progress towards achieving LLIN target in the FCT. A multifaceted four-phase operational research, consisting of a community-based household survey describing ownership and use of LLINs, a review of hospital records on malaria disease, the prevalence of malaria among children under the age of five years and use of sulphadoxine-pyrimethamine as intermittent preventive treatment in pregnancy (IPTp), was used to investigate the extent of access to health services and utilization of malaria control strategies adopted in the FCT with reference to the Roll Back Malaria initiative. Of the 585 households surveyed, only 158 (27%) reported ownership of LLINs and 427 (73%) not owning LLIN ($\chi^2 = 3.83$, $p < 0.05$). Only 2% of adults, 7% under-fives and 19% of pregnant women, respectively slept under LLINs the night before survey. Urban under-fives were 12 times more likely to seek treatment for malaria than their semi-urban counterparts ($\chi^2 = 13.2$, $p = 0.0002$, OR = 12.3, CI = 2.47, 61.35). There was no significant difference in the proportion of women in urban, semi-urban and rural location, who took antimalaria medication during last pregnancy or those who did not. Information, education and communication targeting health promotion on the use of LLIN in FCT could have a salutary impact on the well-being of rural, semi-urban and urban dwellers in Federal Capital Territory, Abuja, Nigeria.

Key words: Community, household, malaria, long lasting insecticidal nets, Federal Capital Territory, area councils, economic burden, gross domestic product.

INTRODUCTION

During the past decade, increased ownership and utilization of protective commodities against malaria,

an infectious disease, such as conventional nets, any mosquito nets (AMNs), insecticide treated mosquito nets (ITNs) and long lasting Insecticide-treated Nets (LLINs) within the household (Hill et al., 2006; Lengeler, 2004; Kulkarni et al., 2010) have contributed significantly to more attention, in terms of coverage with interventions being paid to malaria among the vulnerable groups-children under the age of five and pregnant women (Webster et al., 2005). In the same vein, indoor residual spraying (IRS) (Teklehaimanot et al., 2009; Kim et al., 2012) and artemisinin-based-combination therapies (ACTs) in the health facilities (Roll Back Malaria, 2011; Otten et al., 2009) are expected to bring added value to the entire population in malaria endemic regions in what is referred to as universal coverage (World Health Organization (WHO), 2005; UN Secretary General, 2008). Not surprisingly, during the same period, decrease in malaria morbidity and mortality patterns has been recorded in sub-Saharan Africa (Roll Back Malaria, 2011; Eisele et al., 2009; Eisele et al., 2010; Komatsu et al., 2010), and malaria-related conditions in under-fives, such as episodes of fever, have reduced considerably (Lengeler, 2004).

World Health Organization and many authors have emphasized that annually, an estimated 300 to 500 million new infections and 1 to 3 million deaths result from malaria, and that more than 90% of these cases occur in sub-Saharan Africa, mostly among the poorest without access to health facilities (Webster et al., 2005; WHO, 2011; Ogunremi, 2009; Rowe et al., 2006). An estimated 3.3 billion people were at risk of malaria in 2010 among whom, 2.1 billion were at low risk (< 1 reported case per 1000 population), 94% of who were living in geographic regions other than the WHO African region. The 1.2 billion at high risk (≥ 1 case per 1000 population) were living mostly in the WHO African region (47%) and South-East Asia region (37%) (WHO, 2011). There were an estimated 216 million episodes of malaria in 2010, with a wide uncertainty interval (5th to 95th centiles) from 149 million to 274 million cases. Approximately 81%, or 174 million (113 to 239 million) cases, were in the African region, with the South-East Asian region accounting for another 13%. There were an estimated 655,000 (537,000 to 907,000) malaria deaths in 2010, of which 91% (596,000; range = 468,000 to 837,000) were in the African region. Approximately 86% of malaria deaths globally were of children under five years of age (WHO, 2011).

Despite all efforts, malaria, a disease caused by plasmodium-carrying female Anopheles mosquitoes, remains one of the major causes of morbidity and mortality in Nigeria, with diverse consequences and com-

plications (Okiro et al., 2007). The disease is still the number-one killer of children in many African countries, though the deaths of thousands of children under five years old annually could be prevented by simple cost-effective measures including consistent use of long-lasting insecticide treated mosquito nets by families and anti-malaria treatment for pregnant women (UNICEF, 2007). Still, malaria remains a key public health dilemma for most countries, including Nigeria, where an estimated 300,000 children die of the disease each year, and up to 11% of maternal mortality is caused by it, which represents one in every four deaths of children and one in ten deaths of pregnant women (Federal Ministry of Health/National Malaria Control Program (FMOH/NMCP), 2001, 2010, 2009 to 2013). It is estimated that about half the population of Nigerian adults suffer from at least one episode of malaria annually, that children under five years have as many as three or four episodes every year, and that nearly 110 million cases of malaria are clinically diagnosed annually, accounting for 60% of outpatient visits and 30% of hospitalizations (Komatsu, 2010).

Available evidence suggests that in addition to its direct health impact, malaria imposes a heavy social and economic burden on Nigerians, amounting to a loss of about US \$55 billion per annum, or 12.0% of gross domestic product (Jimoh et al., 2007). The country positioned its National Malaria Control Programme and the contributions of some of its Roll Back Malaria partners namely: WHO, United Nations International Children's Education Fund (UNICEF), World Bank, United States Agency for International Development (USAID) etc to shrink the malaria burden by half by the end of 2010 (FMOH/NMCP, 2009 to 2013), a point in time now shifted to 2015. Of its many strategies, one is to distribute 63 million long-lasting insecticide treated mosquito nets (LLINs), to 32 million households in all 36 states and the Federal Capital Territory (FCT). The campaign is the largest envisaged distribution of LLINs in the world.

About 10 million LLINs were distributed by the National Malaria Control Programme through several channels such as the campaign distribution, Immunization Plus Days (IPDs) and through routine distribution at ante-natal clinics in some parts of Nigeria between 2000 and 2007. This was achieved in collaboration with other implementing partners and some private not-for-profit organizations. For example, from April, 2002 to September, 2009, NetMark, an International NGO supported by USAID, was active in some parts of Nigeria. In partnership with three local NGOs- Malaria Parasite: Africa Fights Back, Delybimb Malaria Foundation, and WomanKind Organization-NetMark conducted free ITN distribution activities in rural communities in Kano, Benue, Abia,

Bauchi, Lagos, Cross River, the Federal Capital Territory Abuja, and Nasarawa States, totaling 305,000 ITNs (AED, n.d.). In Cross River State, NetMark successfully distributed 673,000 LLINs donated by USAID and the Canadian government, in collaboration with State and 18 Local Government Authorities (LGAs) during the integrated measles campaign. Laudable as the operations of NetMark were, the total number of LLINs distributed in FCT by this organization, the exact time of the distribution of the LLINs and the geographical location of the beneficiaries of these LLINs are not yet accessible, at least not through NetMark's report.

It is therefore necessary to review the ownership and use of LLINs in the FCT to ascertain gaps and to fill the identified gaps with government approved malaria control strategies. Some studies on LLIN ownership and use also took place in Nigeria around this time. Ogunremi (2009) reviewed the etiology of malaria, methods of prevention focusing on the compliance to the use of ITNs as a method of prevention in the cities of Ilorin, Kwara state, Zaria in Kaduna state and Abuja and in the FCT in Nigeria. However, the sample size of 240 in all these cities with a combined population of over three million may not have captured the variations in characteristics in the different survey areas and does not give a strong statistical data to draw conclusion on household use of LLINs in those areas. Another study differentiated use and non-use of LLINs between the northern Sahel Savannah and the southern Niger Delta areas of Nigeria and found higher use of LLINs in the southern states than in the northern states (Afolabi et al., 2009). It is imperative that malaria control programmes in Sahel Savannah Areas (SSA) continue to supply LLINs and ensure the use of this commodity for universal coverage and protection (Ahmed and Zerihun, 2010).

There is a lacuna of information on the use of malaria control commodities in the six Area Councils of the Federal Capital Territory of Abuja. Therefore, the objectives of this survey are: (i) To investigate access to and utilization of health services in reference to assess, distribution, ownership and utilization of LLINs among under-fives and among pregnant women by geographical locations at the FCT; (ii) to compare the ownership and use of LLINs in the six Area Councils of the FCT; (iii) to determine the proportion of children below the age of five years and currently pregnant women who slept under LLINs night before survey and (iv) to determine the treatment seeking behavior of children under five years of age living in FCT, Nigeria.

This study assumes the null hypothesis that: (i) There is no significant difference in the proportion of households with LLINs and those without LLINs; (ii) use of LLINs among children less than five years of age is not significantly different since the commencement of Roll Back Malaria (RBM) in FCT; (iii) use of LLINs among

pregnant women is not significantly different since the commencement of RBM in FCT and (iv) distribution of LLINs is not significantly different by Area Councils, that is, no Area Council is favored above the others in LLINs distribution. The epistemological standpoint of this survey is based on the fact that information regarding utilization of health services is best gathered by quantitative analysis because commodities were distributed quantitatively and recorded as such. Household that used or did not use these commodities are also in numbers that can be aggregated or disaggregated.

MATERIALS AND METHODS

This study was conducted in FCT, a malaria endemic area in North-central Nigeria. This location is where the Abuja Declaration on Roll Back Malaria by African Heads of State took place in April, 2000 and where they committed national governments and their development partners to the goal of increasing coverage with ITNs to 60% of target groups by 2005 (WHO, 2000). In 2004, the level of coverage was adjusted to 80% after monitoring the effects of ITNs on various communities in Nigeria (Abebe et al., 2003). The FCT, where Abuja, the capital city of Nigeria is located, was carved out of three states namely: Nasarawa, Niger and Kogi, in 1976. The territory lies just north of the confluence of the Niger and Benue rivers, bordered by the states of Niger to the West and North, Kaduna to the northeast, Nasarawa to the east and south, and Kogi to the southwest. The FCT has a landmass of approximately 7,315 km², of which Abuja city occupies 275.3 km². It is situated within the Savannah region with moderate climatic conditions. Geographically, Abuja is located in the central region of the country, between latitude 8.25 and 9.20 North of the equator and longitude 6.45 and 7.39 East of Greenwich Meridian (National Population Census (NPC), 2005). The FCT is divided into six Area Councils (ACs) because it is not a state but a territory whereas each of the other 36 states in the country is divided into Local Government Areas (LGAs).

Survey site

The six ACs where this study was conducted are Abuja Municipal Area (AMAC), an urban settlement, Gwagwalada, Kuje and Bwari which are semi urban and Abaji and Kwali which are rural areas. Unlike the States of Nigeria which are headed by elected Governor, FCT is administered by the Federal Capital Territory Administration headed by a minister appointed by the President, through the Senate House.

Survey timing

This was a cross-sectional household survey which was conducted between October, 2009 and March, 2010, at the peak of the second rainy season and close to the beginning of the first rainy season. The Federal Ministry of Health (FMOH), through the National Malaria Control Programme (NMCP), Yakubu Gowon Centre (YGC), Millennium Development Goal (MDG), Office of the Federal Capital Territory and UNICEF distributed close to 300,000 LLINs between 2007 and 2009 prior to this survey. Between March to May, 2011, another 524,127 LLINs were distributed by NMCP and

partners such as World Bank, JSI/USAID and Yakubu Gowon Centre in FCT. Therefore, this study serves as an indicator of prior density for access, ownership and use of LLINs and other malaria control commodities in various settings within the FCT in Nigeria.

Study design

To assess household ownership and usage of LLINs and lay the foundation for future distribution of this malaria commodity in the FCT, a survey was conducted about 12 months before the LLIN mass campaign astride the dry and wet seasons. Three cross-sectional surveys were conducted at roughly two months interval using a pre-tested interviewer-administered questionnaire. The community-based interview, using pre-adapted WHO-developed questionnaires, was conducted to randomly-selected household heads (HH) or their representatives when the HH was absent. The main outcome used for the sample-size calculations is the number of children below five years of age that slept under an LLIN the night before the survey. Set at a power of 90%, the survey intended to estimate LLIN usage by these under-fives within an error range of 5%. A response rate of 90% was assumed, a design effect of two and that 60% of the participating households have at least one child that is below the age of five.

Sample size determination

The survey used simple random sampling to determine households to be included in the study. To achieve a 3% precision (level of error) with 95% confidence level, assumed proportion of 0.5 and presumed desire change of 20%, a sample size of 535 households was required for meaningful analysis. This was rounded up to 585 households giving a 10% allowance for non-response rate.

Definitions

For the purpose of this survey, household is defined as “all persons who eat out of the same food bowl (or pot or earthenware) and these persons recognize the same head of household.” Coverage is defined as “the proportion of households possessing at least one LLIN”. Usage is defined as “the proportion of children that were reported to have slept under an LLIN the previous night”. Children under the age of five years were defined as “children aged 0 to 59 months at the time of the campaign”.

Data analysis

Data was entered into statistical package for social science (SPSS) version 17. These data were cleaned and both descriptive and categorical analyses were carried out to assess associations between ownership and usage of malaria control commodities, especially LLINs, in urban, semi-urban and rural settings in the survey area. A chi square test was used to describe differences in proportions. Statistical significance was set at $P < 0.05$.

Ethical clearance

The survey was conducted with the understanding and informed consent of all respondents and caregivers. The survey was approved by the FCT Department of Health, Abuja, Nigeria. The

procedures followed were in accordance with the ethical standards of the committee on human experimentation and in accordance with the Helsinki Declaration.

RESULTS

This household survey was carried out to investigate access to and utilization of health services in reference to distribution, ownership and utilization of LLIN among under-fives and among pregnant women by geographical locations in the six Area Councils of the FCT, Nigeria (Figure 1). The six ACs were geographically identified as urban settlement (Abuja Municipal Area Council [AMAC]), semi-urban settlements (Kuje, Bwari and Gwagwalada [G/lada]) and rural settlements (Abaji and Kwali). The total population of these ACs was 1, 378,931 (NPC, 2005) among whom 2,020 adults and 600 children below the age of 5 years were included in this survey. This figure comprises 1,073 (40.95%) adult males, 947 (36.15%) adult females, 322 (12.3%) under-five males and 279 (10.7%) under-five females, respectively. The 22.9% of under-fives in this survey corresponds to that age group in the population pyramid of the country (NPC, 2005). There were more female respondents between the ages of 16 to 30 years, otherwise, respondents in all other age groups were male dominated (Figure 2). A total of 585 households consented to participate in the survey, with a refusal rate of 2.5%. In all, there were only 158 (27%) households with LLINs in all these ACs, ranging from 19% ownership in the urban settlement (AMAC) to 42% in rural Abaji (Figure 3). Rural settlements were twice more likely to own LLIN compared to urban settlement ($\chi^2 = 5.69$, $p = 0.02$, OR = 2.02, CI = 1.13, 3.62), thereby rejecting the null hypothesis. The average net ownership was less than one net per household. Abaji had the highest average number of 0.4 LLINs per household (Table 1). The Table also indicates that urban settlement has the lowest average number of LLINs/household (0.2) as compared to semi-urban (0.3) and rural (0.3) settlements. The average number of persons per household was 4.5, being highest in the urban settlement (5.3) and lowest in the rural settlement (4.1).

Conversely, the total number of households with LLINs was lowest (19, 19%) where household population was relatively high, and highest (42, 42%) where household population is relatively low. This pattern is also reflected in the proportion of households that own 1, 2 or more than 2 LLINs (Figure 4). Thus, there was a significant difference ($\chi^2 = 3.84$; $df = 1$, $P < 0.05$) in the proportion of households with at least one LLIN (158, 27.0%) and those without LLIN (427, 73.0%) in all the ACs. Detailed illustrations of the population of survey (Table 2 and Figure 2) reflect gender differentiation among adults

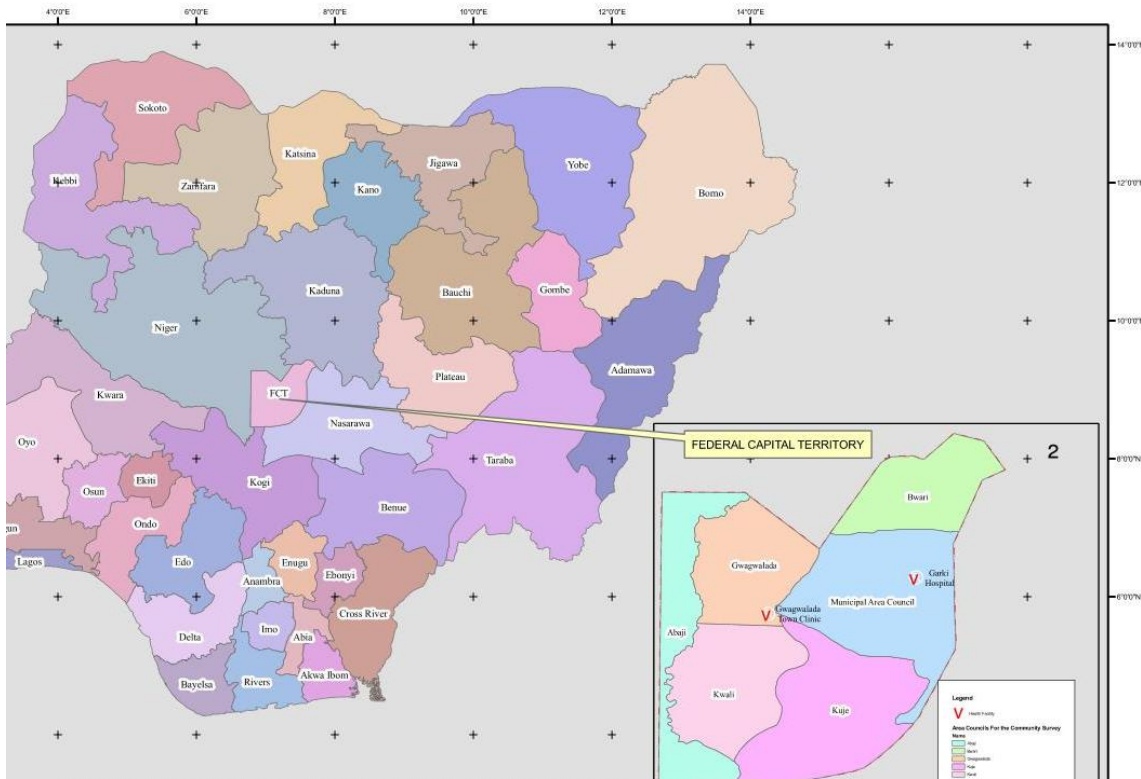


Figure 1. Composite map of Federal Capital Territory (FCT) within Nigeria showing the six Area Councils.

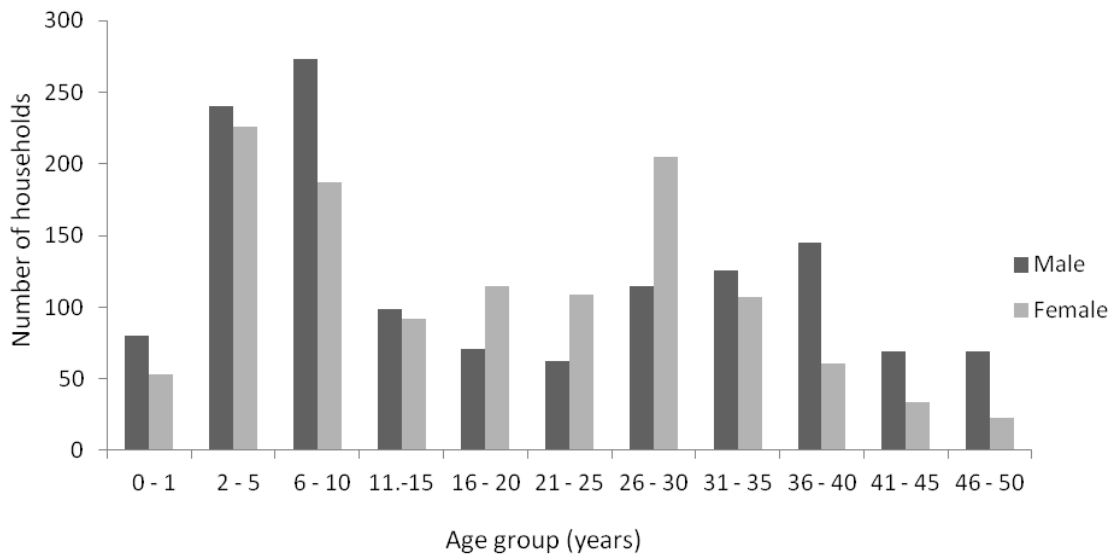


Figure 2. Distribution of age-groups and sex in surveyed households.

(1,073, 53.1% males; 947, 46.9% females) and among the under-fives. Among the 341 women aged 15 to 49

years surveyed in the six ACs, 120 were currently pregnant. Also, there were 600 children less than five

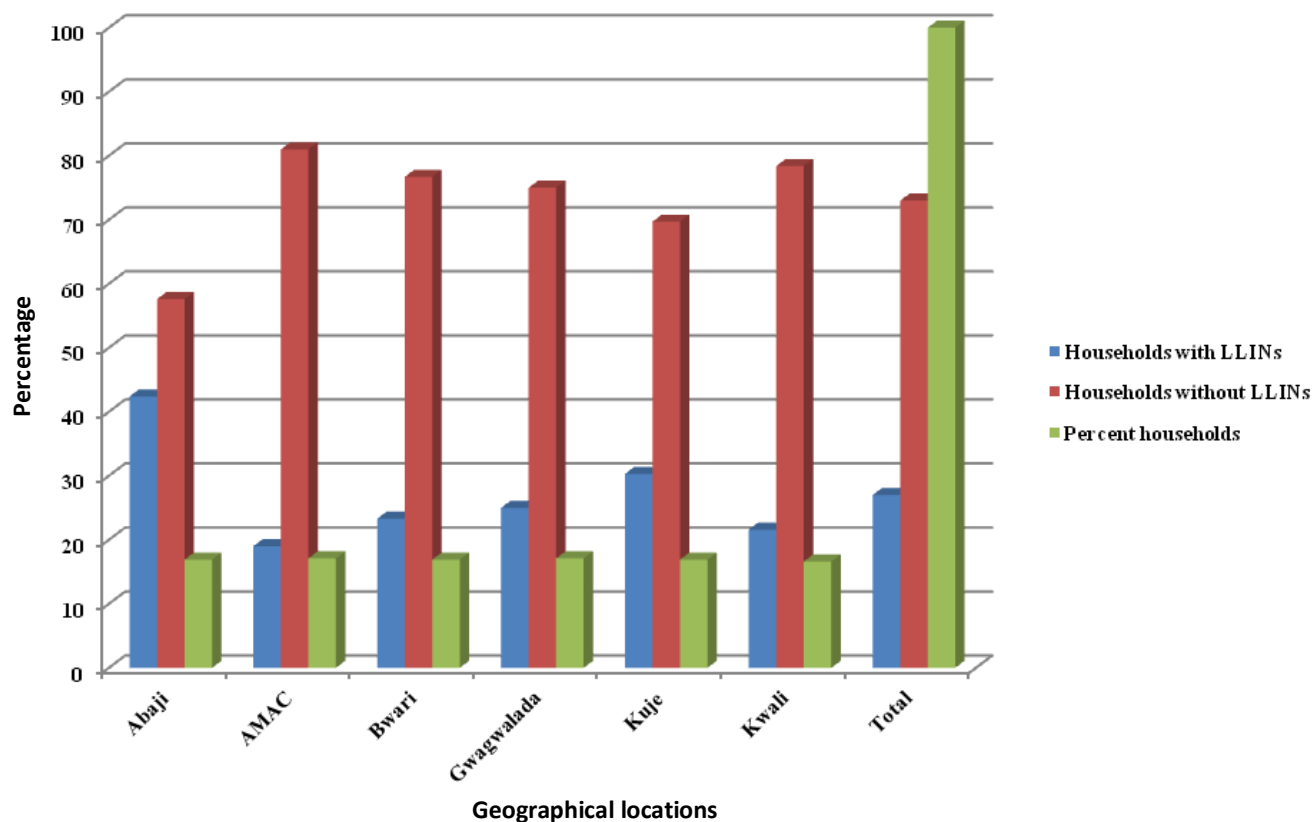


Figure 3. Distribution of households with and without Long Lasting Insecticidal Nets (LLINs) by geographical location in the Federal Capital Territory.

years of age in the survey among whom were 496 respondents distributed unevenly in urban, semi-urban and rural settings. Under-fives participation in this household survey was skewed more to the rural ($\chi^2 = 14.77$, $p = 0.0001$, $OR = 2.86$, $CI = 1.66, 4.97$) and semi-urban ($\chi^2 = 16.32$, $p = 0.00005$, $OR = 2.91$, $CI = 1.71, 4.96$) dwellers who were almost thrice as likely to participate in the survey compared to urban under-fives (Table 3).

The distribution of under-fives and pregnant women who slept or did not sleep under LLINs night before the survey according to geographical location is illustrated in Table 4. Overall, only 33 (7.6%) of surveyed under-fives and only 23 (19.2%) of surveyed pregnant women slept under LLINs the night before survey. To further stress this, no under-five and no pregnant respondent in urban location slept under an LLIN the night before the survey whereas 19 (8.3%) and 14 (7.2%) under-fives in semi-urban and rural locations as well as 15 (30.0%) and 8 (20.5%) of pregnant women in semi-urban and rural areas, respectively slept under an LLIN night before the survey. A significant proportion of semi-urban ($\chi^2 = 6.56$, $p = 0.01$) and rural ($\chi^2 = 5.61$, $p = 0.02$) under-fives, respectively slept under LLIN night before survey

compared to urban under-fives. This trend is also seen among pregnant women in the urban, semi-urban and rural areas of FCT, where overall, only 19.2% of this group of people slept under LLIN the night before survey, leaving a large proportion of them (97, 80.8%) unprotected from malaria attack. However, LLIN use among pregnant women was higher in the semi-urban area (12, 30.0%) compared to urban (0.0%) or rural (20.5%) areas.

Figure 5 illustrates probable wrong use to which LLIN or any net is put in some communities. Not sleeping under LLIN is probably reflected in the treatment seeking behavior of children as shown in Table 5 where, among 168 under-fives with fever two weeks before the survey, 156 (92.85%) sought medical attention from health facilities. Urban under-fives were more than 12 times likely to seek treatment for malaria than their semi-urban counterparts ($\chi^2 = 13.2$, $p = 0.0002$, $OR = 12.3$, $CI = 2.47, 61.35$) while semi-urban under-fives were about 27 times more likely to seek help for fever presumed to be of malaria origin compared to rural under-fives ($\chi^2 = 17.8$, $p = 0.00003$, $OR = 27.4$, $CI = 3.36, 1216.98$). Interestingly, there was no significant difference in the proportion of urban under-fives that sought treatment for malaria when

Table 1. Surveyed households with LLIN ownership according to geographical location of area council: urban, semi-urban, rural.

Parameter	Urban		Semi-urban			Rural		Total
	AMAC	Kuje	Bwari	G/lada	Abaji	Kwali		
Total population	871,596	119,583	61,844	180,497	46,407	99,004	1,378,931	
Total No. of HH surveyed	100	99	90	100	99	97	585	
Total No. of adults in survey	402	411	247	332	267	361	2020	
Total No. of U5s in survey	123	109	72	122	71	103	600	
Av. No. of persons per HH	5.3	5.3	3.5	4.5	3.4	4.7	4.5	
Av. No. of persons per location	5.3		4.8		4.1			
Total No. of HH with LLINs	19	30	21	25	42	21	158	
Total No. of HH without LLINs	81	69	69	75	57	76	427	
χ^2	2.14		1.95		5.69		-	
P	0.14		0.16		0.02		-	
OR	1.52		1.33		2.02		-	
CI	0.87, 2.67		0.89, 1.98		1.13, 3.62		-	
Av. No. of LLINs per HH	0.2	0.3	0.2	0.3	0.4	0.2	0.3	
Av. No. of LLINs per HH/location	0.2		0.3		0.3			
No. (%) HH owning 1 LLIN	15 (15)	21 (21)	16 (18)	23 (23)	33 (33)	17 (18)	125 (21)	
No. (%) HH owning 2 LLINs	4 (4)	9 (9)	5 (6)	2 (2)	8 (8)	3 (3)	31 (5)	
No. (%) HH owning >2 LLINs	0 (0)	0 (0)	0 (0)	0 (0)	1 (2)	1 (5)	2 (1)	

Av = average, OR = odd ratio, CI = confidence interval, No. = number

compared to rural under-fives ($\chi^2 = 0.43$, $p = 0.51$, OR = 0.45, CI = 0.008, 8.89).

A total of 341 (75, 22.0% urban; 156, 45.7% semi-urban and 110, 32.3% rural) women of reproductive age were interviewed for their use or non-use of antimalarial during last pregnancy. Among these, 220 (64.5%) claimed they took antimalarial during last pregnancy, 67 (19.7%) claimed they did not and 54 (15.8%) claimed did not know whether they took antimalarial or not (Table 6). Between 2007 and 2009, a total of 296,556 LLINs have been distributed in FCT (Table 7). There was no significant difference in the proportion of women in urban, semi-urban and rural location that took or did not take antimalarials during last pregnancy.

DISCUSSION

It is now clear that there is on-going reduction in child mortality, with some African countries reporting less than 76 deaths of children under five per 1,000 births (Roll Back Malaria, 2011), indicating significant advances in

the fight against the malaria disease in sub-Saharan Africa. According to the reported information, the advance in the fight against malaria is due largely to the mass distribution of treated mosquito nets, especially the LLINs, to pregnant women. This study documents the unexpected situation of malaria control commodities and/or programmes not getting to target populations or communities. There are still various communities in sub-Saharan Africa (SSA) where children and pregnant women cannot access appropriate health services such as malaria control programmes.

Malaria infection in pregnancy can lead to devastating consequences for both mother and child. The World Health Organization's recommended policy for malaria prevention and control is a package of intermittent preventive treatment (IPTp) and insecticide treated nets (WHO, 2004). These interventions have the potential to substantially reduce the disease burden and adverse outcomes of malaria in pregnancy. The strategic approaches to malaria control fall into two major categories – prevention and case management. Taken together, these strategies work against both the transmission of the

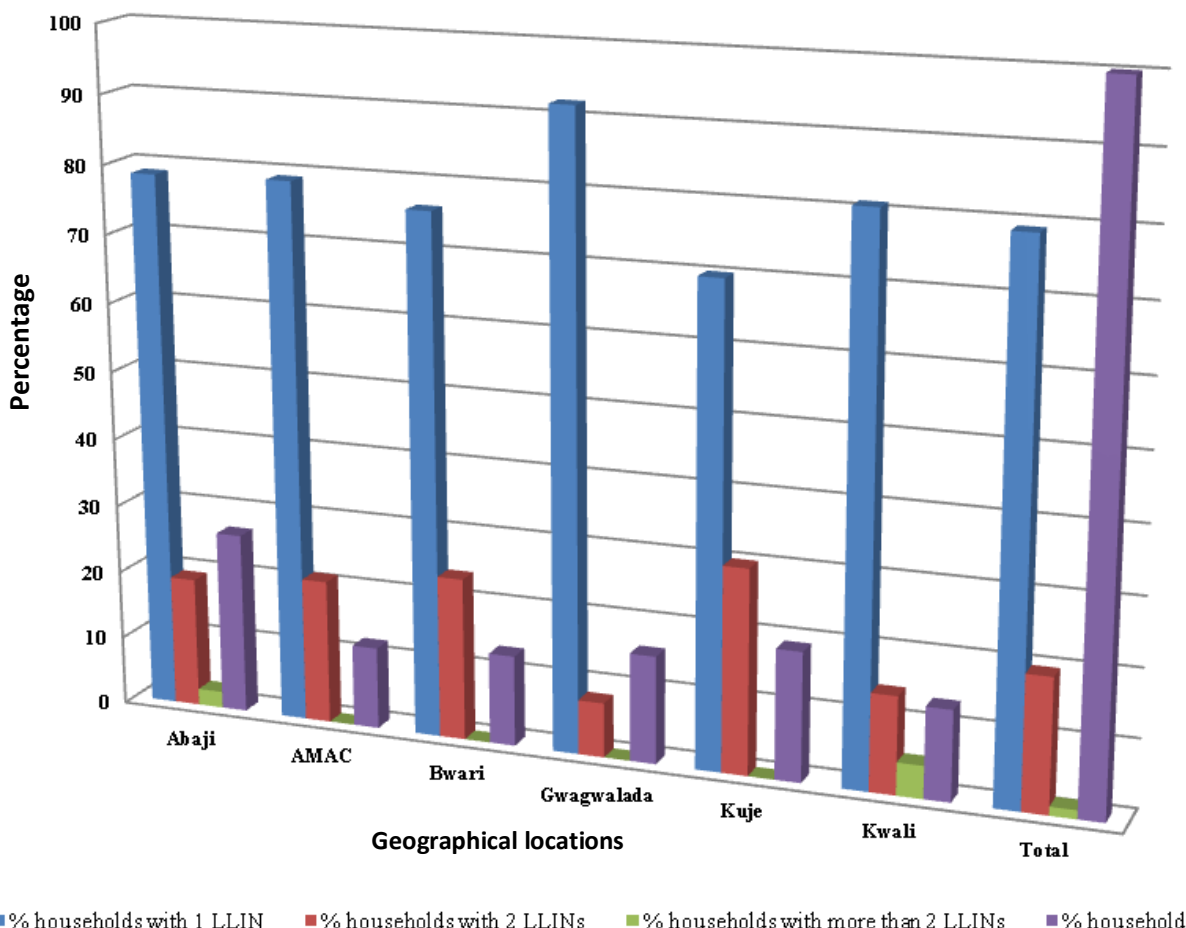


Figure 4. Distribution of quantity of LLINs households by geographical location in the Federal Capital Territory.

parasites from mosquito vector to humans and from humans to mosquitoes and the development of illness and severe disease in humans (WHO, 2010). Because high coverage rates are needed to realize the full potential of protective agents such as LLINs, WHO recommended that all people at risk in areas targeted for malaria prevention should be covered with LLINs, that is, “universal coverage” (WHO, 2007i, ii).

Evidence abounds that increase coverage of LLIN in target areas enhances protection of vulnerable groups and protects all community members (Kulkarni, 2010; Nevill et al., 1996). The drive to achieve universal coverage of LLINs does not contradict the fact that pregnant women are still a more vulnerable group that needs to be protected from anemia and death themselves and miscarriage, low birth weight and greater infant and child mortality for their offspring (Roll Back Malaria, 2011). So far, the data on net coverage for pregnant women is not encouraging, as indicated in this

study and other studies (Ahmed and Zerihun, 2010; Thwing et al., 2008). LLIN is of exceptional imperative because this commodity is about the only safe non-invasive malaria control intervention that women can use as from the time they enter the reproductive age group and throughout pregnancy.

In line with our results, a study found that 45 of 47 SSA countries had an ITN policy for pregnant women and that estimated coverage was 17% among the nearly 28 million pregnancies at risk of malaria in the 32 countries with information (<http://www.sciencedaily.com/releases/2011/01/110126081653.htm>, n.d.). Furthermore, among 39 countries with an IPTp policy, 25% of pregnant women had received some IPTp, despite 77% visiting an antenatal clinic (ANC), the main delivery channel for reaching pregnant women with ITNs and IPTp (<http://www.sciencedaily.com/releases/2011/01/110126081653.htm> n.d.).

Table 2. Proportion of adults, currently pregnant women and children under five years old in the survey by Area Council.

Area Council	Adults		Total No. of pregnant women	Women 15-49 yrs old		Total	No. In survey	Children under 5 years of age		
	Male frequency (%)	Female frequency (%)		No. in survey frequency (%)	Currently pregnant frequency (%)			No. of respondents	Males frequency (%)	Females frequency (%)
Abaji	216 (20.1)	186 (19.6)	2,320	32 (9.4)	17 (7.0)	9,281	123	95	62 (19.3)	61 (21.9)
AMAC	218 (20.3)	193 (20.4)	43,580	75 (22.0)	31 (13.0)	174,319	109	74	56 (17.4)	53 (19.0)
Bwari	131 (12.2)	116 (12.2)	8,092	36(10.6)	15 (10.0)	32,369	72	60	31 (9.7)	41 (14.7)
G/lada	160 (14.9)	172 (18.2)	9,025	77 (22.6)	12 (5.0)	36,099	122	106	68 (21.2)	54 (19.4)
Kuje	143 (13.3)	124 (13.1)	5,979	43 (12.6)	23 (15.0)	23,917	71	62	39 (12.2)	32 (11.5)
Kwali	205 (19.1)	156 (16.5)	4,950	78 (22.9)	22 (11.0)	19,801	103	99	65 (20.2)	38 (13.6)
Total	1,073 (53.1)	947 (46.9)	73,946	341 (100.0)	120(100.0)	296,786	600	496	321 (53.5)	279 (46.5)

Table 3. Chi-square relationship between under-five respondents and non-respondent in the survey.

Location	Children under 5 years of age			X ²	P	OR	CI
	No. in survey	Respondents	Non-respondents				
Urban	109	74	35	16.3	0.00005	2.9	1.7, 5.0
Semi-urban	265	228	37				
Urban	109	74	35	14.8	0.0001	2.9	1.7, 5.0
Rural	226	194	32				
Semi-urban	265	228	37	0.004	1.0	1.0	0.6, 1.6
Rural	226	194	32				

Methods to protect pregnant women from malaria are still underutilized in SSA (KEMRI-Wellcome Trust Research Programme, n.d.). In spite of the major efforts, coverage in many parts of malaria-endemic SSA is still inadequate and needs to be scaled up (<http://malaria.wellcome.ac.uk>), an observation that agrees with our result of about 19% of pregnant women that slept under LLIN the night before survey, leaving a gap of about 80% if

universal coverage is considered. This is in consonance with another study conducted within the same region that detailed LLIN usage among pregnant women at 19% and documented lack of awareness as a challenge faced by pregnant women in accessing LLINs (Salaudeen et al., 2009). Even where there is awareness, some pregnant women still need the approval of their husbands or other “seniors” or influential people in

the hierarchy of the household to access LLINs. In general, low coverage with IPTp and LLINs contrasts with correspondingly high ANC attendance, indicating that there are missed opportunities for coverage and as such, the attainment and maintenance of high coverage of ITNs remains challenging.

In summary, whilst most countries have adopted national policies aimed at reducing and controlling

Table 4. Percent distribution of under-fives and pregnant women who slept or did not sleep under LLINs night before survey relative to geographical location.

Area Council	Children under the age of 5 years					Pregnant women				
	Slept under LLIN freq. (%)	Did not sleep under LLIN freq. (%)	χ^2	p	OR (CI)	Slept under LLIN freq. (%)	Did not sleep under LLIN freq. (%)	χ^2	p	OR (CI)
Urban										
AMAC	0 (0.0)	74 (100.0)	6.7	0.10	0.0 (undefined)	0 (0.0)	31 (100.0)	0.83	0.002	0.0 (undefined)
Semiurban										
Kuje	2 (3.2)	60 (96.8)	2.9	0.09	0.29 (0.07-1.30)	3 (13.0)	20 (87.0)	5.72	0.02	0.19, (0.04, 0.78)
Bwari	4 (6.7)	56 (93.3)	0.3	0.6	0.72 (0.23-2.29)	7 (46.7)	8 (53.3)	2.78	0.09	2.95 (0.82, 10.68)
G/lada	13 (12.3)	93 (87.7)	4.0	0.05	2.70 (0.99-7.95)	5 (41.7)	7 (58.3)	1.00	0.32	2.00 (0.52, 7.76)
Sub-total	19 (8.3)	209 (91.7)	*6.5	0.01	0.0 (undefined)	15 (30.0)	35 (70.0)	*11.27	0.0008	0.00 (undefined)
Rural										
Abaji	13 (13.7)	82 (86.3)	11.6	0.0007	15.54 (1.99, 121.30)	8 (47.1)	9 (52.9)	12.7	0.0003	0.0 (undefined)
Kwali	1 (1.0)	98 (99.9)				0 (0.0)	22 (100.0)			
Sub-total	14 (7.2)	180 (92.8)	**5.6 ***0.18	0.02 1.17 (0.57, 2.40)	undefined	8 (20.5)	31 (79.5)	**7.08 ***1.02	0.008 0.31	0 (undefined) 1.66 (0.62, 4.45)
Total	33 (6.7)	463 (93.3)	-	-	-	23 (19.2)	97 (80.8)	-	-	-

*=comparison between urban and semi-urban, **=comparison between urban and rural, ***=comparison between semi-urban and rural.

Table 5. Treatment seeking behaviour of children under 5 years (U5) by location.

Area council	No. of Under-5s	No. with fever in past 2 weeks freq. (%)	Sought treatment Freq. (%)	Did not seek treatment Freq. (%)	χ^2	P	OR	CI
Urban								
AMAC	74	65 (87.8)	63 (96.9)	2 (3.1)	13.2	0.0002	12.3	2.47, 61.35
Semiurban								
Bwari	60	7 (11.7)	3 (42.9)	4 (57.1)			-	
G/lada	106	14 (13.2)	13 (92.9)	1 (7.1)			-	
Kuje	62	11 (17.7)	7 (63.6)	4 (36.4)			-	
Sub-total	228	32 (14.0)	23 (71.9)	9 (28.1)	17.8	0.00003	27.4	3.36, 1216.98
Rural								
Abaji	95	6 (6.3)	5 (83.3)	1 (16.7)			-	
Kwali	99	65 (65.7)	65 (100.0)	0 (0.0)			-	
Sub-total	194	71 (36.6)	70 (98.6)	1 (1.4)	0.43	0.51	0.45	0.008, 8.89



Figure 5. Some unorthodox uses of treated mosquito nets (Source: <http://allafrica.com/stories/201206130598.html>).

Table 6. Women in the survey aged 15 to 49 years who took antimalarials medication during pregnancy by geographical location.

Area council	Total No. of pregnant women	Total No. of pregnant women in the survey	Took antimalarial medication Freq. (%)	Did not take antimalarial medication Freq. (%)	Don't know Freq. (%)	χ^2	P	OR	CI
Urban									
AMAC	43,580	75	58 (77.3)	13 (17.3)	4 (5.3)	1.97	0.16	1.7	0.81, 3.47
Semiurban									
Bwari	8,092	36	23 (63.9)	9 (25.0)	4 (11.1)				
G/lada	9,025	77	41 (57.7)	9 (11.7)	27 (35.1)			-	
Kuje	5,979	43	21 (48.8)	14 (32.6)	8 (18.6)				
Sub-total	23,096	156	85 (54.5)	32 (20.5)	39 (25.0)	0.75	0.37	0.8	0.41, 1.42
Rural									
Abaji	2,320	32	25 (78.1)	3 (9.4)	4 (12.5)				
Kwali	4,950	78	52 (66.7)	19 (24.4)	7 (9.0)				
Sub-total	7,270	110	77 (70.0)	22 (20.0)	11 (10.0)	0.38	0.54	1.3	0.59, 2.74
Total	73,946	341	220 (64.5)	67 (19.7)	54 (15.8)			-	

Table 7. Distribution of LLINs in FCT between 2007 and 2009.

Distributor	Year of distribution	Quantity distributed
Federal Ministry of Health	2007	20,000
Yakubu Gowon Centre	2008	18,398
Millennium Development Goals, Federal Capital Territory	2008	245,000
Health and Human Services Secretariat, FCT/UNICEF	2009	13,158
Total	2007 – 2009	296,556

malaria in pregnancy, it is clear that, with some notable exceptions, not enough progress has been made towards the new RBM goals or the policy ambitions of each country. With only three years in which to meet the Millennium Development Goals, it is sobering that in countries with a national policy for IPT and/or ITN, a large number of pregnancies remain unprotected by an ITN and by IPTp. Greater effort to fully understand the reasons why coverage is so low and to develop strategies to combat this is urgently needed to protect the tens of millions of pregnancies in sub-Saharan Africa threatened by malaria every year.

By greatly reducing malaria transmission, LLINs decrease the risk of others in the community coming into contact with an infected mosquito. Every LLIN user thereby contributes not only to his or her safety, but also to the safety of others through the mass effect (<http://www.givewell.org/international/technical/programs/insecticide-treatednets#>). The effect is analogous to herd immunity from vaccines. It makes sense to assume that to have maximum effect within communities, LLIN coverage should be as high as possible, with a target of complete coverage (<http://www.malariaconsortium.org/pioneer/pages/what-we-do/long-lastinginsecticidal-nets.>). The mass effect works in three ways. First, mass coverage by LLINs reduces the number of infective mosquitoes in the community. Second, mass coverage shortens the lifespan of the mosquitoes, thus reducing the possibility for maturation of *Plasmodium* sporozoites and hence decreasing the proportion of mosquitoes that become infective. Therefore, the possibility of transmitting the illness to others is greatly reduced. Third, with some *Anopheles* species, there is a possibility that mass coverage might divert mosquitoes from human to animal biting, thereby reducing human to human transmission, though this requires further studies.

However, *Anopheles gambiae* is so anthropophilic that, even with nearly 100% coverage with insecticidal nets, about 80% of blood meals were found to come from human beings. Taking together these effects on the vector population can greatly reduce transmission of disease, but only if the coverage of mosquito nets is sufficiently high. Importantly, at low coverage, the

mosquitoes that are deflected by the nets will tend to seek out another human being to bite. There would be little or no reduction in overall transmission, but only a diversion. If transmission was diverted from high-risk to low-risk individuals that would be beneficial there would be no major effect on intensity of transmission of malaria in the community. Optimum community protection is achieved when mass coverage with LLINs is combined with universal access for the community to timely and effective treatment in the event of infection. However, a tracking system, as well as a strong community health education should be put in place to monitor LLIN use in the community and avoid wastage and inappropriate use (Brieger, 2012). Timely treatment can also be expected to have a community benefit. By clearing the infection in the patient as soon as possible, the individual is not only cured of the disease but is also no longer a reservoir of parasites for transmission to others.

Limitations

This study has some notable limitations. First, the survey is localized to FCT and the sample size and sampling technique might be inadequate to reflect overall net ownership and usage in FCT or generalized to net ownership and usage in Nigeria. The nets distributed before this survey are unaccounted for since the details of the distributions are unavailable to the authors. We relied on primarily on self-reported information which is subject to deficient recall and social interest bias.

Secondly, an in-depth analysis of access to LLIN was not done since the LLIN was supposed to have been distributed free of charge to women and children below 5 years of age. The type of LLINs prevalent in each geographical area, that is, rectangular or conical, was not accounted for; the cost of each net, if purchased in the open market or given free (transport from home to collection centre and from there back home) was not extracted from households, and the willingness-to-pay for the commodities (LLINs, ACTs, SP) when out of stock was not recorded or calculated. Next, analysis of net use among women of reproductive age was not considered. Recall of use of medicines to prevent malaria during last

pregnancy, an event which could have taken place between two weeks and at least one year prior to the survey is always a challenge. Information on the outcome of the last pregnancy was not retrieved from the women in reproductive age.

Lastly, this survey did not probe further on the types of antimalarials taken by pregnant women or when during their current pregnancy, the antimalarials were taken and on other types of medication, whether orthodox or unorthodox, taken during current pregnancy.

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Full Length Research Paper

Epidemiology of *Candida vaginitis* in women of reproductive age in selected hospitals in Onitsha metropolis, Anambra state, Nigeria and its environs 2007-2012

Dennis O. Ugochukwu

Biotechnology department, Federal University of Technology, Owerri, Imo State Nigeria.

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The main objective of this study was to determine the prevalence and distribution of *Candida vaginitis* in women of reproductive age in Onitsha metropolis and its environs. A retrospective (survey) study of 811 high vaginal swabs (HVS) recorded samples and results of patients with symptomatic *C. vaginitis* were done between 2007 and 2012. The study also attempted to ascertain if relationships existed between certain bio-social characteristics (e.g. age, marital status, physiologic state, location and occupation and the prevalence of *C. vaginitis*). The results showed that the different age groups recorded different prevalence rates of *C. vaginitis* with 22 to 26 years having the highest with 28.9% (234/811). Higher prevalence rate of 76.8% (623/811) was recorded for non pregnant women against 23.2% (188/811) recorded for pregnant women. Similarly, significant relationships were established between variables like marital status, location, occupation of the subjects and the prevalence of *C. vaginitis* ($P < 0.05$). The authors concluded by recommending compulsory high vaginal swab (HVS) screenings on all women of reproductive age. HVS culture test should be done to confirm or exclude involvement of *Candida albicans* for any observation of vaginal discharge on any woman before treatment. The authors went ahead to advise the health planners to use the findings of this study in their future plans.

Key words: Epidemiology, *Candida vaginitis*.

INTRODUCTION

Vast majority of cases of *Candida vaginitis* are caused by *Candida albicans*, with 5 to 20% produced by *Candida glabrata* or *Candida tropicalis* (Herbst et al., 1992). *C. vaginitis* is a common gynaecological finding among women worldwide (Anderson et al., 2004; Naglik et al., 2003). It is of more frequent occurrence among more sexually active women, that up to 75% of them have had the experience (Schroppei et al., 1994; Lisiak et al., 2003). The commonest organism implicated is *Candida albicans* (Simoes et al., 1998; Ken, 1991; Ferrej, 2000;

Da Rossa and Rimel, 2004). The predisposing factors include abuse of antibiotics, which kill the good and beneficial bacteria, allowing yeast overgrowth, hormonal fluctuations as in pregnancy and use of oral contraceptives among others (Geiger et al., 1995; Sobel et al., 1998). The commonest sign of infection is vaginal discharge which could be generally profuse, thick, odourless or malodorous, white profuse, yellow or green purulent, and symptoms also include vulvar itching, dysuria and pruritus (Ching, 2002). Findings from 450

Table 1. Age distribution of the people with vulvovaginal candidiasis.

Age group	Frequency	Percentage
17-21	125	15.4
22-26	260	32.1
27-31	234	28.9
32-36	123	15.2
37 and above	69	8.5
Total	811	100

Table 2. Physiologic state of people and the frequency of case.

Physiologic state	Frequency of <i>C. albicans</i>	Percentage frequency of <i>C. albicans</i>
Pregnant	188	23.2
Not pregnant	623	76.8
Total cases	811	100

randomly selected sexually active women in Maiduguri Nigeria showed that 14.7% had *C. albicans* (Ojiyi et al., 2012). This makes it necessary to bridge the information gap, promote good health among the people of the area and for comparative purpose by conducting this study in Onitsha metropolis and its environs. In a rural community in the semi-arid zone, North- Eastern Nigeria, Nwosu and Djieyeb (2007) in a study among 311 pregnant women aged 16 to 37 years reported *C. albicans* in 56.3%. In Abakaliki South Eastern Nigeria, Adeoye et al. (2009) in a study of the prevalence of *Trichomonas vaginalis* and *C. albicans* among 200 antenatal women, reported 27.5% *C. albicans*. In Port Harcourt, Nigeria, prevalence of *C. albicans* was 38.3% among 129 patients aged 15 to 30 years with symptomatic vaginitis (Mbakwem et al., 2012). The aim of this study was to determine the level of involvement of *C. albicans* in cases of vaginitis in women of reproductive age attending the two hospitals in Onitsha and Ogidi, and examine the role of age, occupation, marital status and physiological state of the people. The authors discovered that work of this nature has been done in so many cities, both in Northern and Southern Nigeria as cited in studies, but none in the present area of study in Onitsha and its environs, Anambra state, South Eastern Nigeria. This makes it necessary to bridge the information gap, promote good health among the people of the area and for comparative purpose.

MATERIALS AND METHODS

Collection of samples

The study was carried out at the microbiology laboratories of well attended private women hospital in Onitsha and mission hospital in Ogidi, all in Anambra State. The study was retrospective in nature. The data generated on high vaginal swabs (HVS) collected from

women of reproductive age (17 years and above) that attended the hospitals from 2007 to 2012 were used. Altogether, 811 patient's data were reviewed from their laboratory results records. Additional information was obtained from the patients' hospitals records on the symptoms and other clinical details. This enables us to exclude women on their monthly period and those receiving vaginal related fungal treatment when they visited the hospitals, as these would likely affect the laboratory results. All others within the age bracket needed for the work were reviewed.

Statistical analyses

The numbers of cases selected and reviewed were noted. *C. vaginitis* positives and *C. vaginitis* negatives were also noted. The distribution of these as regards age, marital status, physiologic state (pregnant or non-pregnant), location (rural or urban) and occupation of the patients were presented in frequency tables and chi-square was used to analyze the results.

RESULTS

Of a total of 811 patients reviewed, people within the age of 22 to 26 years had the highest prevalence of *C. albicans*, followed by 27 to 31 years. The differences in prevalence were statistically significant at $P < 0.05$ (Table 1).

Total women of 188 pregnant women reviewed recorded 23.2% prevalence of *C. albicans*, against 76.8% obtained from 623 non-pregnant women. The difference was statistically significant at $P < 0.05$ (Table 2).

The review of 347 married women from 811 total cases recorded 42.8% prevalence of *C. albicans*, while 464 non-married people had 57.2%. The difference between 2 categories was statistically significant at $P < 0.05$ (Table 3). As it concerned the location of the people, from 273 urban dwellers reviewed produced 33.7%, while from 538 rural dwellers, 66.3% prevalence of *C. albicans* was obtained.

Table 3. Marital status of people and frequency of *Candida albicans*.

Marital status	Frequency of <i>C. albicans</i>	Percentage frequency of <i>C. albicans</i>
Married	347	42.8
Not married	464	57.2
Total cases	811	100

Table 4. Location of people and frequency of *C. albicans* cases.

Locations	Frequency of <i>C. albicans</i>	Percentage frequency of <i>C. albicans</i>
Urban dwellers	273	33.7
Rural dwellers	538	66.3
Total cases	811	100

Table 5. Occupation of people and frequency of *C. albicans* cases.

Occupation	Frequency of <i>C. albicans</i>	Percentage frequency of <i>C. albicans</i>
Civil servants	263	32.4
House wives	124	15.3
Traders	264	32.6
Students	160	19.7
Total cases	811	100

The difference was statistically significant at $P < 0.05$ (Table 4). Among occupational groups, traders had the highest occurrence of *C. albicans* (32.6%), while full time house wives had the lowest (15.3%) as shown in Table 5. The differences between different occupational groups were statistically significant ($P < 0.05$).

DISCUSSION

The results revealed that the highest prevalence of *C. vaginitis* (32.1%, caused by *C. albicans*) was observed in 22 to 26 years age group. This is a sexually active group and could be as a result of that. Okungbowa et al., (2003) in a study of age distribution of *Candida* infection amongst pregnant women in Benin city had similar report. The result identified three age groups with high occurrence of *Candida* infection: 17 to 23 (51.7%), 24 to 30 (41.5%), and 31 to 37 (36.4%) years. Though they worked with pregnant patients, but age group 17 to 23 years with the highest infection (15.7%) is similar to that established in this work. This they also attributed to the group being the most sexually active age range which further strengthens the belief that sexual activity could contribute to a large extent, the spread of the disease (Ononge et al., 2005).

Traders had the highest occurrence; this agrees with the report of Wenjin and Yifu (2006). Traders, though have enough money for adequate laboratory/treatments in hospitals, but may not spare time to do so. Thus, it is

likely that most of them could resort to buying and consuming drugs without visiting the hospitals. This amounts to abuse of drugs which is one of the factors that increase the rate of *C. albicans* infections. Rural dwellers are adjudged to be low in personal hygiene than their urban counterparts, thus the higher *Candida* occurrence rate was recorded among them. Inadequate hygiene is one of the factors that increase the occurrence of *Candida* infection.

The findings of this study showed that pregnant women had less prevalence of *C. albicans* 188 (23.2%) than non-pregnant women 623 (76.8%). This could be as a result of the number of pregnant women whose data were reviewed when compared with the number of non-pregnant women.

Perhaps, for this reason it differed from the high incidence rate of *C. albicans* in pregnant women 23 (51.1%) compared to non-pregnant women 12 (30.8%) reported by Isibor et al. (2011) among women attending Irrua Specialist Hospital, Irrua, Nigeria. They attributed this to increased oestrogen content, glycogen in the acidity of the vagina due to rich glycogen content of the vaginal mucosa. This provided ample supply of utilizable sugar that favors the growth of *C. albicans* during pregnancy.

CONCLUSION AND RECOMMENDATION

The findings in this work have made it imperative for

laboratory investigations to be carried out whenever there is symptom of vaginitis in women of reproductive age to identify the correct causative organisms for effective treatment. Since this study has established that the prevalence and distributions of the *C. albicans* among the women are significantly dependent on the following factors: age, marital status, physiologic state, location and occupation of the subjects, the authors are recommending compulsory HVS screenings for women of reproductive age at short intervals as a way of promoting good health. The health planners are also advised to use these findings in their future plans.

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Full Length Research Paper

Missed opportunities in the diagnosis and management of protein energy malnutrition among children under 5 years in Wakiso district, Uganda

Roselyne Akugizibwe*, Josephine Kasolo, Duncan B. Makubuya and Ali M. Damani

College of Health Sciences, Makerere University, Kampala, Uganda.

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Protein energy malnutrition (PEM) is one of the leading causes of death among children below 5 years in Uganda. It develops after acute childhood illnesses despite children having received treatment from health facilities. This study assessed knowledge and practices of health workers in the diagnosis and management of PEM, which was used to establish missed opportunities to prevent severe acute malnutrition (SAM) in its management. This was a cross sectional descriptive study that used questionnaires and observation of health workers at Health Center IV (HCIV) in Wakiso district, Uganda. The clinical nutrition diagnosis of the children was then obtained. There were 44 health workers that assessed 225 children. Most of the health workers 32 (72.7%) had education in PEM management and over 60% of them knew the forms of PEM, clinical signs of kwashiorkor and marasmus and the factors that predispose to PEM. Health workers did not weigh 56 (24.9%) of the children, 193 (86%) children had no height taken and only 32 (14.2%) had mid upper arm circumference measured. The weight for height of 223 (99.2%) and weight for age of 109 (93%) children was not calculated. Only 38 (16.89%) were examined for edema and 40 (17.78%) for muscle wasting. Health workers diagnosed only 21 (9%) children with malnutrition, while researchers found 94 (31.9%) with malnutrition. Children who missed opportunity to have malnutrition diagnosed at the health facility were 73 (32.9%). The knowledge of health workers on PEM is adequate, but their practice is inadequate. There is missed opportunity to diagnose and manage PEM among children who present with acute illnesses at the health centers, hence missed opportunity to prevent SAM.

Key words: Uganda, protein energy malnutrition, missed opportunity, health workers.

INTRODUCTION

Malnutrition is the cellular imbalance between the supply of nutrients and energy and the body's demand for them to ensure growth, maintenance, and specific functions (WHO). The term protein energy malnutrition (PEM) includes marasmus, kwashiorkor, and intermediate states of marasmic-kwashiorkor. Children may present with a mixed picture of marasmus and kwashiorkor, or milder forms of malnutrition (Scheinfeld et al., 2012).

In 2000, world health organization (WHO) estimated that malnourished children were 181.9 million (32%) in

developing countries. In addition, an estimated 149.6 million children under 5 years are malnourished when measured in terms of weight for age. The same report indicated that in South Central Asia and Eastern Africa, about half of the children have growth retardation due to PEM (WHO/Nutrition for Health and Development (NHD), 2000).

PEM has been identified as the most lethal form of malnutrition indirectly or directly causing annual death of at least 5 million children worldwide. Estimates indicate

*Corresponding author. E-mail: shakeel.mahmood@gmail.com

that 35.8% of pre-school children in developing countries are under weight, 42.7% are stunted and 9.2% are wasted (Onis et al., 1993). These children are at a higher risk of morbidity, mortality and carry adverse mental health consequences through their lives. A study carried out in Nigeria, estimated a mortality rate of 40.1% which although lower than the WHO estimate of 60%, is still very high and marasmic-kwashiorkor was found to be associated with higher case fatality rate than other types of PEM (Ubesie et al., 2012). In addition, the relative risk of mortality, because of low weight-for-age is elevated for each cause of death and for all-cause mortality (Caulfield et al., 2004).

In Uganda, it is estimated that 11% of children are born already stunted and about 16% of children are wasted at birth due to high fertility rates, young maternal age, short birth interval and malnutrition (Uganda Demographic and Health Survey (UDHS), 2006). Malnutrition directly and indirectly contributes 60% of child mortality in Uganda and PEM is one of the greatest single contributors to childhood mortality in the country, although it is rarely listed as a direct cause (UHSSIP 2010/11-2015).

Poor access to nutritious foods in context of rising food prices is a common cause of malnutrition (Onis et al., 1993). A malnourished child has poor immunity leading to compromised resistance to illnesses, therefore he falls ill, and the malnourishment worsens (United Nations Children Fund (UNICEF), 1998).

Nutritional status of children is determined by history, clinical examination and anthropometric measurements; height-for-age, weight-for-age, weight-for-height, head circumference, mid-upper arm circumference, and skin fold thickness which is compared to WHO reference charts (Antwi, 2011).

Integrated Management of Acute Malnutrition (IMAM) is a strategy by Ministry of Health Uganda to address acute malnutrition and focuses on integration of management of acute malnutrition into on-going routine health services at all levels of the health infrastructure and recommends that routine nutrition assessment and management should be incorporated in all treatment, care and support services (Charlette et al. 1996). The integrated guidelines also contain the necessary information on the factors that lead to malnutrition, proper diagnosis and management of malnutrition (Elamin, 2010).

There is a great opportunity of preventing and treating malnutrition in children attended to by health workers during acute illnesses. Children develop malnutrition few weeks after they have been attended to at the health facility which could have been prevented by the health worker managing the mild-moderate PEM or by advising the care takers/mothers on proper nutrition during sickness and recovery. Despite the Ministry of Health providing guidelines on identification and management of malnutrition in sick children, health workers attend to sick children without a nutritional focus (Elamin, 2010).

The study had an aim of assessing the knowledge and practices of health workers on PEM so as to establish

missed opportunities in its early diagnosis and management. Preventing PEM from progressing to severe acute malnutrition (SAM) in or after acute childhood illnesses is a great challenge to the health systems, yet few studies are available to establish the magnitude of the problem.

METHODOLOGY

It was a descriptive cross sectional study in which health workers in the five Health Centre IVs (HCIV's) in Wakiso district were interviewed to determine their knowledge on PEM. It also observed them as they managed children with acute childhood illnesses, in particular assessing the ability of the health workers to identify PEM, treat and advise care takers on its prevention.

The study participants included all the clinical officers and nurses involved in treatment of children under five years at outpatient clinics, pediatric wards and nutrition clinics. At each health facility, 9 health workers looked after under five children during the time of the study making a sample size of 44 respondents. The questionnaire was administered by a research assistant, while observations were carried out by the investigators.

The study tools included a questionnaire administered that collected demographic characteristics and knowledge of health workers attending to children below five years. A check list was filled in as the health workers were being observed as they managed the children and a child assessment form on which nutritional parameters measured were recorded by the investigators.

The questionnaire was pre-tested among a few health workers in Mulago hospital Uganda and the adjustments made. Informed and written consent was obtained from the health workers and the children care takers. The Institutional Review Board (IRB) approval was obtained from Makerere University College of Health Sciences.

Data analysis

Data was entered into EPI Data version 3.1 and then exported to Statistical Package for Social Sciences (SPSS) version 16 for analysis. Continuous variables were summarized using means and standard deviations, while categorical variables were summarized using frequencies. Wakiso district is located in Central Uganda, coordinates 00°24'N 32°29'E.

RESULTS

Knowledge of health workers

Of the respondents interviewed, 32 (72.7%) had ever received continuing medical education (CME) or training in PEM and agreed that PEM was a common condition among children.

Respondents' knowledge in the management of PEM

All the respondents could not categorize the management of PEM into stabilization and rehabilitation phases, but they could explain how to manage PEM.

Health workers practice

Twenty two percent of the children were assessed in

Wakiso Health Centre and Kasangati Health Centre, 20% were assessed in Namayumba Health Centre and 18% were assessed in each of the health centers, Ndejje Health Centre and Buwambo Health Centre.

Availability of instruments

Of the 5 visited health centres, 2 (40%) had ready-to-use therapeutic foods (RUFT) for treatment of PEM, 3 (60%) had mid upper arm circumference (MUAC) tapes, 3 (60%) had height boards; all the health centers did not have the ministry of health IMAM guidelines 2010, while all the health centers had weighing scales.

Advice to care takers

Majority of the children's care takers 181 (80.44%) were advised on nutrition of the child during illness and 113 (50.2%) of the children's caretakers were advised about child feeding when the children recovers from the illness.

Child assessment by the researchers

Of all the children assessed in the study, 50 (22%) were from Wakiso HCIV, 50 (22%) from Kasangati HCIV, 44 (20%) from Namayumba HCIV and 40 (18%) from each of the health centers Ndejje and Buwambo.

Physical examination of the children

On physical examination, 19 (8.4%) had edema, 54 (24.0%) had wasting, 34 (15.1%) had hair changes, 43 (19.1%) had skin changes, 40 (17.8%) had Apathy and 14 (6.2%) had wizen monkey look.

Different diagnoses of the children made by the health workers

Of the assessed children, only 9% of the children were diagnosed with malnutrition by the health workers, while malaria and respiratory tract infections were the most common illnesses in the health centers with a total of 64%.

Nutritional diagnosis of the children as assessed by the researchers

Of the children assessed, 131 (58%) had good nutritional status, 6 (2%) had kwashiorkor, 42 (19%) had marasmus, and 4 (2%) had marasmic-kwashiorkor, while 42 (19%) had low weight for age.

DISCUSSION

This study identified the knowledge and practices of health workers in the 5 HCIVs of Wakiso district Uganda. All the health workers who manage sick children at the health facilities were interviewed and observed as they attended to the children. The study was able to identify missed opportunities to prevent mild-moderate PEM from progressing to SAM. This is because there was missed diagnosis of PEM among the children, hence no action was taken to treat the PEM or prevent it from progressing to SAM. The study participants were 44 with a mode age category of 30 to 39 years. The health workers were all adults of different qualifications and with diverse experiences in healthcare. Most of the respondents were females 31 (70.5%), which is the same trend in other health facilities in the country. Majority of the health workers involved in the care of children were registered nurses 18 (40.9%), 17 (38.6%) clinical officers and 3 (6.8%) enrolled nurses. This explains why they had adequate knowledge in the diagnosis and management of PEM since malnutrition is one of the topics taught in their training schools. Nursing aids 2 (4.5%) and village health team (VHT) members 2 (4.5%) were mainly involved in the immunization of children and also in anthropometric recordings of malnourished children and because they have little training, some cases of mild-moderately malnourished children were not diagnosed at immunization. Most 31 (70.5%) of the health workers are in some form of marital union which agrees with the Uganda demographic and health survey (UDHS, 2006) that 49% of women and 50.1% of men between 15 and 49 years are married (Table 1).

Knowledge

Majority of the respondents 32 (72.7%) have ever had a training and CME in the diagnosis and management of PEM. This is why most of the health workers had adequate knowledge on the factors that lead to PEM among children, the forms of PEM, the clinical signs of PEM and management of PEM (Tables 2 to 4).

Most of the respondents reported low social economic conditions, ignorance of parents about importance of child nutrition, child abuse, improper weaning practices and infections like measles and diarrhea, use of bottle-feeding with diluted and dirty formula predisposing the child to infection and reduction of breastfeeding as major factors leading to malnutrition (Table 2). Kikafunda et al. (1998) reported that similar factors cause malnutrition. These same factors are also found in the IMAM Guidelines (2010) for the health workers to appreciate. Understanding the factors that lead to PEM is very important, because its health helps the health workers to promote good nutrition by helping to remove the basic causes of malnutrition (Kavishe, 1998).

The study found that majority of the respondents knew

Table 1. Demographic data of the health workers.

Characteristic	Frequency (n = 44)	Percentage (%)
Age (years)		
20-29	13	29.4
30-39	20	45.5
40-49	7	16.0
50-59	3	6.8
60-69	1	2.3
Sex		
Male	19	43.2
Female	25	56.8
Marital single		
Single	13	29.5
Married	31	70.5
Qualification		
Nursing assistant	2	4.5
clinical officer	17	38.6
Dispenser	1	2.3
Enrolled nurse	3	6.8
Nursing officer	18	40.9
Senior anesthetic	1	2.3
VHT	2	4.5

the different forms of PEM with the least known being marasmus 34 (68%) (Table 2). It is important for the health workers to know the different form of PEM, because they cannot diagnose the types which they do not know. The clinical signs of kwashiorkor and marasmus were mentioned by over 60% of the health workers (Table 3) which is good, because knowing the clinical signs of kwashiorkor and marasmus is essential in the diagnosis of PEM especially in differentiating the two forms for proper management.

Although the IMAM guidelines categorizes management of acute PEM into stabilization and rehabilitation phase, the study revealed that the health workers knew most of the things done in the management of SAM, but none of them knew about the different phases of management of malnutrition, which are well articulated in the IMAM guidelines. Stabilization phase in the management of SAM is very important and lack of the earlier mentioned knowledge may affect the health workers ability to manage SAM in that they may not manage the emergency complications first and hence lead to mortality of some of the children (Ashworth, 2001). This could be because the health workers do not have the IMAM guidelines at the health facility to help them keep up to date with information (Table 4).

More than 60% of the respondents had adequate knowledge on nutritional health education to give the

caretakers in order to promote good nutrition of the children (Table 4) and the information given was found to be the same recommended by the IMAM guidelines 2010, although some of the information was not widely known by the respondents especially the importance of breast feeding 26 (52%), yet the IMAM guidelines takes breast feeding to be important in the prevention of SAM. This is attributed to lack of the IMAM guidelines at the health facilities for the health workers to keep reminding themselves of the key points in the management of malnutrition.

Practice of health workers

All the health centers visited had weighing scales; however, a significant number 56 (24.9%) of children were not weighed contrary to the recommendations of the WHO (1999) guidelines that recommends to weigh all the children that come to the health centre for growth monitoring. In addition, weight is important in determining low weight for age and wasting (Antwi, 2011), hence this contributes to missed diagnosis in the identification of PEM and it may be due to too much worker load, because the same health workers care for children and adults (Table 5).

Most 3 (60%) of the health centers had MUAC tapes. Those centers that did not have them cannot measure the mid upper arm circumference of the children which is an important parameter in the diagnosis of PEM leading to missed diagnosis. Furthermore, even those centers that had the MUAC tapes were not using them as evidenced by the low numbers 32 (14.2%) of children whose MUAC was measured (Table 5). This poor practice contributes to missed diagnosis of PEM, hence missed opportunity to prevent mild-moderate PEM from progressing to SAM. This probably may be due to lack of knowledge on how to use the MUAC tapes, heavy work load or not knowing how to diagnose malnutrition using MUAC.

Of the health centers visited, 3(60%) had height boards which means that the health centre that did not have them could not measure height of the children, yet measurement of height is an important parameter in the diagnosis of underweight and stunted growth (WHO, 1999). However, even those centers that had the boards were not measuring the height since just 32 (14.2%) of the children had their height measured. It is most likely that the health workers think it is not important to measure height of the children or they are too busy to do it (Table 5).

The study revealed that all the five health centers visited did not have the IMAM Guidelines (2010). In addition to that, all the health workers interviewed had never seen the guidelines. This explains the knowledge gaps in the diagnosis and management of PEM since they do not have any references. These guidelines were adapted and published in 2010 to address issues of

Table 2. Respondents' knowledge on the factors that lead to malnutrition and the different forms of PEM.

Factors that lead to protein energy malnutrition among children below 5 years	Frequency of those who knew (n = 44)	Those who knew (%)
Ceasing or reduction of breastfeeding	31	62
Improper weaning practices like introduction of supplementary food abruptly	34	68
Use of bottle-feeding with diluted and dirty formula predisposing the child to infection	29	58
Low social economic conditions	40	80
Ignorance of parents about the importance of child nutrition	39	78
Infection like measles, Pertusis and diarrhea	34	68
Child abuse (neglect)	36	72
Respondents knowledge of the forms of PEM		
Kwashiorkor	43	86
Marasmus	34	68
Marasmic-kwashiorkor stunted growth	39	78
Low weight for age	36	72

Table 3. Respondents' knowledge on the clinical signs of kwashiorkor and marasmus.

Characteristic	Frequency (n = 44)	Percent	
Kwashiorkor	Edema	30	60
	Apathy	34	68
	Hair changes	40	80
	Skin changes	37	74
Marasmus	Severe wasting	37	74
	Baggy pants	31	62
	Old man' s look	35	70
	Increased appetite	32	64

malnutrition and guide health workers to manage PEM (malnutrition) properly; yet by August 2012, the book had not reached the health workers in health centers which are close to the Ministry of Health headquarters. This affects service delivery, because if the health workers had the guidelines, they would try to follow them and look out for malnutrition in every child they encounter.

Although RUFT is the recommended treatment for severely malnourished children by the MOH Uganda and WHO, only two of the visited health centers had RUFT in their stock. This implies that those health centers without RUFT will not be able to manage the children diagnosed with SAM and will refer them to the centers that have these facilities. Referral of these children may not save their life since some caretakers may not have transport to go to the referral site due to high poverty levels (UDHS, 2006), leading to increased mortality rate.

Observation from the study also found out that only 16 (7.1%) weight for age and 2 (0.89%) weight for height of the children were calculated using standard charts, yet the WHO (1999) management of severe malnutrition manual considers them to be important in the diagnosis

of stunted growth and wasting. This could be attributed to heavy work load and lack of WHO standard charts where to compare the values got (Table 5). This leads to missed diagnosis of PEM.

Of the children observed, 38 (16.89%) of them were examined for edema, 40 (17.78%) for muscle wasting, 40 (18%) for hair changes and 113 (50.2%) for skin changes. This means that the health workers were not looking out for the signs of PEM and the children with PEM can be missed. This is probably, because the health workers assume that the children do not have PEM since they do not have the classical picture of malnutrition (Table 5). All the children that were diagnosed with PEM had SAM and could not be missed since it is seen instantly.

Majority of the children's caretakers 181 (80.44%) were advised on nutrition of the child in sickness and most of 113 (50.2%) of them were advised on nutrition of the child after recovery which was good since PEM and deficiencies in the macronutrient stores of fat and somatic protein are common in critically ill infants and children (Pollack et al., 1982). However, the information given was

Table 4. Respondents' knowledge on the management of PEM and nutritional education to be given to the caregivers.

Respondents' knowledge of the management of PEM	Frequency of those who knew (n = 44)	Those who knew (%)
Prevention and treatment of hypoglycemia and hypothermia	34	68
Treatment/Prevention of dehydration	34	68
Correction of electrolyte imbalance	30	60
Treatment/prevention of infection	33	66
Starting on cautious feeding on RUFT	42	84
Micronutrient supplementation (VIT A, folic acid and zinc)	42	84
Plan to complete immunization	35	70
Sensory stimulation (toy to play with)	39	78
Plan for return date, follow up and growth monitoring	40	80
Respondents' knowledge of nutritional education to be given to the caregivers		
Nutrition healthy education on child feeding and meals planning	42	84
Tell her the importance of gardening in her yard if she has land	28	56
Advice on when to return for follow up (growth monitoring)	32	64
The importance of hygienic preparation and storage of food	39	78
Importance of breastfeeding	26	52
Immunization	33	66
The danger of bottle feeding	36	72
Exclusive breast feeding up to 4-6month and addition of complementary food thereafter	37	74

Table 5. Anthropometric measurements and physical examination of the children which were done by the health workers.

Characteristic	Frequency (n = 225)	Percentage
Anthropometric measurements done		
Children Weighed	169	74.4
Children measured height	32	14.1
Children measured MUAC	32	14.1
Children whose weight for age was calculated	16	7.0
Children whose weight for height was calculated	2	0.4
Children's appetite test done	1	0.4
Physical examination of the children		
Children whose feet were press to check for edema	38	16.7
Children whose skin was pinched on the upper arm to feel for Muscle wasting	40	17.6
Children whose mothers were asked their age	208	92.1
Children whose Hair changes were noted	40	17.6
Children whose Skin changes were checked	114	50.2

scanty. For example, most of them were told to give the child good food and not told the type of food to give or the reason for proper nutrition during illness, yet good health education improves the knowledge and behavior of caregivers' regarding child nutrition (Kapurura and Beke, 2013).

Child assessment by data collectors

Majority 177 (78.9%) of the children assessed were from

2 months to 2 years and most 122 (54.2%) were females. The children involved in the study were assessed immediately as they left the health worker's consultation room and 145 (64%) of the children had weights between 6 and 11.9 kg, 193 (85.8%) of the children were between 60 and 99 cm in height, while 200 (88.9%) had MUAC between 11 and 16.9 cm. These parameters (weight and height) were utilized with age and physical examination to determine the nutritional status of the children using the WHO standard charts for boys and girls differently (Table 6).

Table 6. Demography and anthropometric measurements of children assessed by the researchers.

Characteristic	Frequency (n = 225)	Percentage
Age (year)		
Less than 1	69	32.9
1-2	104	46.0
3-4	55	24.5
4-5	6	2.6
Sex		
male	103	45.8
female	122	54.2
Weight (kg)		
3-5.9	20	8.6
6-8.9	69	30.3
9-11.9	76	33.6
12-14.9	38	16.8
15-17.	19	8.3
18-20.9	3	1.3
Height (cm)		
50-59	17	7.4
60-69	50	21.7
70-79	62	27.4
80-89	41	18.1
90-99	38	16.6
100-109	11	7.4
MUAC (cm)		
8.7 -10.9	6	2.4
11-12.9	53	23.3
13-14.9	91	40.3
15-16.9	56	24.8
17-19.9	19	8.3

The study identified missed opportunity to prevent mild to moderate PEM from progressing to SAM by examining the observed children and comparing the nutritional diagnosis of the health workers with that of the researchers. As per the diagnoses got from the children's books, 144 (64%) of them were diagnosed with malaria and respiratory tract infections which is understandable since they are the commonest diseases at health centers and malaria is responsible for more illnesses and death than any other single disease in Uganda (UDHS, 2006).

Only 21 (9%) of the children were diagnosed with malnutrition by the health workers which is low since in Uganda, 47% children under 5 years are stunted, 7% are wasted and 17% are under weight (UDHS, 2011). The researchers diagnosed 42 (18.7%) children with under-

weight, 4 (1.8%) with marasmic-kwashiorkor, 42 (18.7%) with marasmus and 6 (2.7%) with kwashiorkor. These findings correlate to the prevalence rate found by Kikafunda et al. (1998), where 3.8% children had kwashiorkor, 24.1% were underweight and 19.5% of unhealthy children had marasmus both in rural and urban areas in central Uganda. This study was done in HCIVs, while the aforementioned study was done in a home setting and although Wakiso district is also in Central Uganda; it is more of an urban area so these differences account for the slight changes in the prevalence rates of PEM (malnutrition). In total, 94 (41.9%) children had malnutrition after assessment by the researchers. These findings confirm that the number of the children with malnutrition was higher than what was diagnosed and treated by the health workers. It is important to carry out ongoing training and supervision and also to identify and address the health workers' individual difficulties, because a study in Gambia showed that even after training, severe malnutrition was both under-diagnosed and wrongly diagnosed by trained nurses (Hamer et al., 2004).

From the study findings therefore, 73 (32.9%) of the children were not diagnosed with malnutrition and they left the consultation rooms with no idea that they need to improve their diet, hence an opportunity to prevent their PEM from progressing to SAM was missed when they visited the health facility with acute illness. Unlike the study done in Rwanda where the under diagnosis of malnutrition in infants and young children was due to the use of incorrect growth references for measuring nutritional status (Binagwaho et al., 2011), this study found out that the health workers do not follow the IMAM guidelines which recommend the integration of management of malnutrition into the on-going routine health services at all levels of the health infrastructure and routine nutritional assessment to be incorporated in all treatment, care and support services.

Conclusion

The researchers set out to find the knowledge and missed opportunity to prevent mild to moderate PEM from progressing to SAM in the management of PEM among children less than 5 years by health workers of Wakiso district and it was carried out in the five HCIVs of the district. It is evident from the study that the knowledge of the health workers in the diagnosis and management of PEM is adequate, but the nutritional education given to care takers is inadequate. Despite the health workers having good knowledge on PEM, they do not put in practice what they know. In addition, the health centers in Wakiso district do not have all the equipments necessary for management of PEM. The study found out that there is a huge magnitude of missed opportunity to diagnose and treat PEM among children who present with acute

illnesses at the HCIVs.

RECOMMENDATIONS

- 1) The Ministry of Health Wakiso district needs to train health workers in the diagnosis and management of PEM using the IMAM Guidelines (2010) and build the capacity of health workers in clinical malnutrition in order to reduce missed opportunity to diagnose PEM at health centers.
- 2) Proper messages on Information Education Communication (IEC) materials on the diagnosis and management of PEM should be availed and displayed in clinics where children are treated.
- 3) The Ministry of Health Wakiso district should provide all the necessary equipment to facilitate the health workers to diagnose and treat PEM.
- 4) Another research should be done to identify reasons for the disparity between the knowledge and practice of health workers in Wakiso district.
- 5) The Ministry of Health should employ a nutritionist to assess the nutritional status of all children who come to the health centers and make a nutritional diagnosis since the health workers have too much work load, because they care for children and adults.

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ABBREVIATIONS

CME, Continuing medical education; **DHO**, district health officer; **HCIV**, health center IV; **HW**, health worker; **HC**, health centre; **IMAM**, integrated management of acute malnutrition; **ITC**, inpatient therapeutic care unit; **MAM**, moderate acute malnutrition; **MESAU-MEPI**, medical education for equitable services to all Ugandans-medical education partners' initiative; **MOH**, ministry of health; **MUAC**, mid upper arm circumference; **NHD**, nutrition for health and development; **OTC**, outpatient therapeutic care unit; **PEM**, protein energy malnutrition; **RUFT**, ready-to-use therapeutic foods; **SAM**, severe acute malnutrition; **SFP**, supplementary feeding programs; **UDHS**, Uganda demographic and health survey; **UHSSIP**, Uganda health survival strategy and investment plan; **VHT**, village health team; **WHO**, world health organization.

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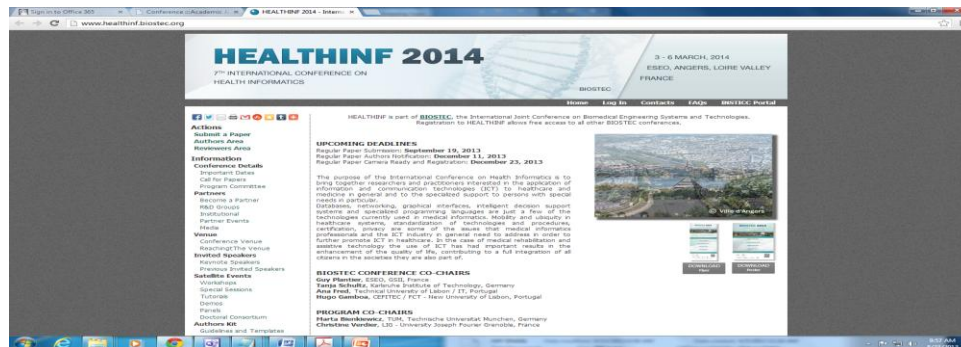
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