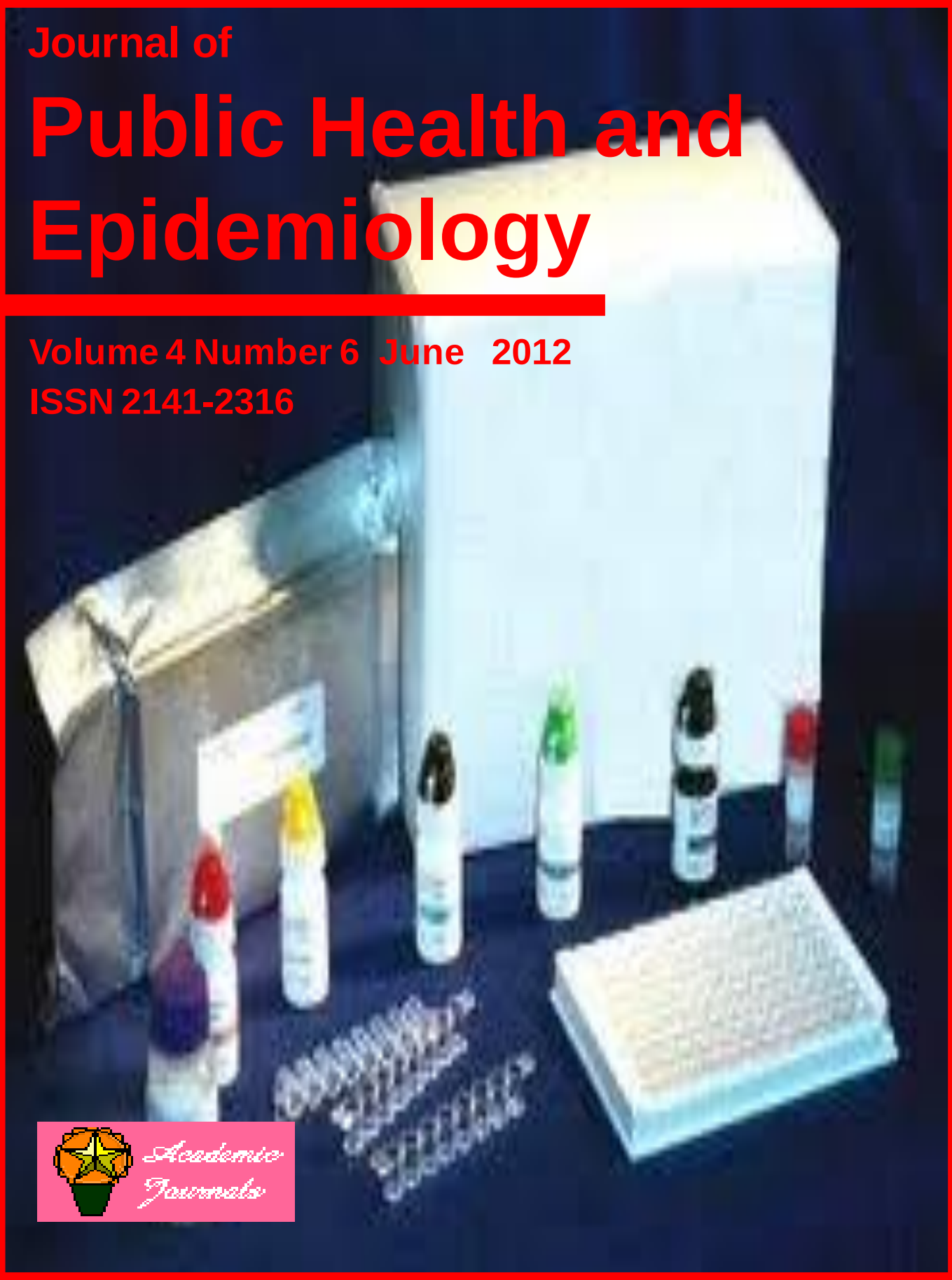
Journal of

Public Health and Epidemiology

Volume 4 Number 6 June 2012
ISSN 2141-2316



Academic Journals

ABOUT JPHE

The **Journal of Public Health and Epidemiology (JPHE)** is published monthly (one volume per year) by Academic Journals.

Journal of Public Health and Epidemiology (JPHE) is an open access journal that provides rapid publication (monthly) of articles in all areas of the subject such as health observatory, biostatistics, occupational health, behavioral medicine etc. The Journal welcomes the submission of manuscripts that meet the general criteria of significance and scientific excellence. Papers will be published shortly after acceptance. All articles published in JPHE are peer-reviewed.

Submission of Manuscript

Submit manuscripts as e-mail attachment to the Editorial Office at: jphe@acadjournals.org. A manuscript number will be mailed to the corresponding author shortly after submission.

The Journal of Public Health and Epidemiology will only accept manuscripts submitted as e-mail attachments.

Please read the **Instructions for Authors** before submitting your manuscript. The manuscript files should be given the last name of the first author.

Editors

Editorial Board

Instructions for Author

Electronic submission of manuscripts is strongly encouraged, provided that the text, tables, and figures are included in a single Microsoft Word file (preferably in Arial font).

The **cover letter** should include the corresponding author's full address and telephone/fax numbers and should be in an e-mail message sent to the Editor, with the file, whose name should begin with the first author's surname, as an attachment.

Article Types
Three types of manuscripts may be submitted:

Regular articles: These should describe new and carefully confirmed findings, and experimental procedures should be given in sufficient detail for others to verify the work. The length of a full paper should be the minimum required to describe and interpret the work clearly.
Short Communications: A Short Communication is suitable for recording the results of complete small investigations or giving details of new models or hypotheses, innovative methods, techniques or apparatus. The style of main sections need not conform to that of full-length papers. Short communications are 2 to 4 printed pages (about 6 to 12 manuscript pages) in length.

Reviews: Submissions of reviews and perspectives covering topics of current interest are welcome and encouraged. Reviews should be concise and no longer than 4-6 printed pages (about 12 to 18 manuscript pages). Reviews are also peer-reviewed.

Review Process

All manuscripts are reviewed by an editor and members of the Editorial Board or qualified outside reviewers. Authors cannot nominate reviewers. Only reviewers randomly selected from our database with specialization in the subject area will be contacted to evaluate the manuscripts. The process will be blind review.
Decisions will be made as rapidly as possible, and the journal strives to return reviewers' comments to authors as fast as possible. The editorial board will re-review manuscripts that are accepted pending revision. It is the goal of the JPHE to publish manuscripts within weeks after submission.

Regular articles

All portions of the manuscript must be typed double-spaced and all pages numbered starting from the title page.

The Title should be a brief phrase describing the contents of the paper. The Title Page should include the authors' full names and affiliations, the name of the corresponding author along with phone, fax and E-mail information. Present addresses of authors should appear as a footnote.

The Abstract should be informative and completely self-explanatory, briefly present the topic, state the scope of the experiments, indicate significant data, and point out major findings and conclusions. The Abstract should be 100 to 200 words in length.. Complete sentences, active verbs, and the third person should be used, and the abstract should be written in the past tense. Standard nomenclature should be used and abbreviations should be avoided. No literature should be cited.
Following the abstract, about 3 to 10 key words that will provide indexing references should be listed.

A list of non-standard **Abbreviations** should be added. In general, non-standard abbreviations should be used only when the full term is very long and used often. Each abbreviation should be spelled out and introduced in parentheses the first time it is used in the text. Only recommended SI units should be used. Authors should use the solidus presentation (mg/ml). Standard abbreviations (such as ATP and DNA) need not be defined.

The Introduction should provide a clear statement of the problem, the relevant literature on the subject, and the proposed approach or solution. It should be understandable to colleagues from a broad range of scientific disciplines.

Materials and methods should be complete enough to allow experiments to be reproduced. However, only truly new procedures should be described in detail; previously published procedures should be cited, and important modifications of published procedures should be mentioned briefly. Capitalize trade names and include the manufacturer's name and address. Subheadings should be used. Methods in general use need not be described in detail.

Results should be presented with clarity and precision. The results should be written in the past tense when describing findings in the authors' experiments. Previously published findings should be written in the present tense. Results should be explained, but largely without referring to the literature. Discussion, speculation and detailed interpretation of data should not be included in the Results but should be put into the Discussion section.

The Discussion should interpret the findings in view of the results obtained in this and in past studies on this topic. State the conclusions in a few sentences at the end of the paper. The Results and Discussion sections can include subheadings, and when appropriate, both sections can be combined.

The Acknowledgments of people, grants, funds, etc should be brief.

Tables should be kept to a minimum and be designed to be as simple as possible. Tables are to be typed double-spaced throughout, including headings and footnotes. Each table should be on a separate page, numbered consecutively in Arabic numerals and supplied with a heading and a legend. Tables should be self-explanatory without reference to the text. The details of the methods used in the experiments should preferably be described in the legend instead of in the text. The same data should not be presented in both table and graph form or repeated in the text.

Figure legends should be typed in numerical order on a separate sheet. Graphics should be prepared using applications capable of generating high resolution GIF, TIFF, JPEG or Powerpoint before pasting in the Microsoft Word manuscript file. Tables should be prepared in Microsoft Word. Use Arabic numerals to designate figures and upper case letters for their parts (Figure 1). Begin each legend with a title and include sufficient description so that the figure is understandable without reading the text of the manuscript. Information given in legends should not be repeated in the text.

References: In the text, a reference identified by means of an author‘s name should be followed by the date of the reference in parentheses. When there are more than two authors, only the first author‘s name should be mentioned, followed by ’et al‘. In the event that an author cited has had two or more works published during the same year, the reference, both in the text and in the reference list, should be identified by a lower case letter like ’a‘ and ’b‘ after the date to distinguish the works.

Examples:

Abayomi (2000), Agindotan et al. (2003), (Kelebeni, 1983), (Usman and Smith, 1992), (Chege, 1998; 1987a,b; Tijani, 1993,1995), (Kumasi et al., 2001)
References should be listed at the end of the paper in alphabetical order. Articles in preparation or articles submitted for publication, unpublished observations, personal communications, etc. should not be included in the reference list but should only be mentioned in the article text (e.g., A. Kingori, University of Nairobi, Kenya, personal communication). Journal names are abbreviated according to Chemical Abstracts. Authors are fully responsible for the accuracy of the references.

Examples:

Chikere CB, Omoni VT and Chikere BO (2008). Distribution of potential nosocomial pathogens in a hospital environment. Afr. J. Biotechnol. 7: 3535-3539.

Moran GJ, Amii RN, Abrahamian FM, Talan DA (2005). Methicillinresistant Staphylococcus aureus in community-acquired skin infections. Emerg. Infect. Dis. 11: 928-930.

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.

Pelczar JR, Harley JP, Klein DA (1993). Microbiology: Concepts and Applications. McGraw-Hill Inc., New York, pp. 591-603.

Short Communications

Short Communications are limited to a maximum of two figures and one table. They should present a complete study that is more limited in scope than is found in full-length papers. The items of manuscript preparation listed above apply to Short Communications with the following differences: (1) Abstracts are limited to 100 words; (2) instead of a separate Materials and Methods section, experimental procedures may be incorporated into Figure Legends and Table footnotes; (3) Results and Discussion should be combined into a single section.
Proofs and Reprints: Electronic proofs will be sent (e-mail attachment) to the corresponding author as a PDF file. Page proofs are considered to be the final version of the manuscript. With the exception of typographical or minor clerical errors, no changes will be made in the manuscript at the proof stage.

Fees and Charges: Authors are required to pay a $650 handling fee. Publication of an article in the Journal of Public Health and Epidemiology is not contingent upon the author's ability to pay the charges. Neither is acceptance to pay the handling fee a guarantee that the paper will be accepted for publication. Authors may still request (in advance) that the editorial office waive some of the handling fee under special circumstances.

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, or thesis) that it is not under consideration for publication elsewhere; that if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher.

Journal of Public Health and Epidemiology

Table of Content: Volume 4 Number 6 June 2012

ARTICLES

Research Articles

Journal of Public Health and Epidemiology Vol. 4(6), pp. 150-155, June 2012
Available online at http://www.academicjournals.org/JPHE
DOI: 10.5897/JPHE12.035
ISSN 2070-1845 ©2012 Academic Journals

Full Length Research Paper

An analysis of tuberculosis in developing and developed world: Nigeria and UK as a case study

Semeeh A. Omoleke

Medical Research Council Unit (UK), Fajara, P. O. Box 273, Banjul, The Gambia. E-mail: talk2semeeh@yahoo.co.uk or somoleke@mrc.gm. Tel: +2203124499.

Accepted 9 May, 2012

Tuberculosis (TB) is a re-emerging infectious disease of international health priority. It is particularly worrisome in Africa, which informed the declaration of public health emergency by the World Health Organisation in 2005. In this study, inferences were drawn from the literature, secondary data and empirical observations. The results indicated that TB still remains a major public health challenge, particularly in the developing world where the socio-economic indices are quite appalling. Despite these, there seems to be little or no sincere political will, as the health systems in such settings are still weak (infrastructural decay, poor workforce strength and low level of motivation, poor health financing and poor service delivery) and incapable of coping with this challenge. There are also concerns about surveillance data generated from the developing world as this might have undermined TB control strategies. Therefore, if the Millennium Development Goals (MDGs) 6C is to be realised, the socio-economic and political determinants of TB, being the root cause should be given adequate attention while simultaneously addressing the challenges confronting the medical approach. In addition, a countrywide prevalence survey is strongly recommended as a first step in understanding the true epidemiology and combating the scourge of TB in these regions. A well conducted national prevalence survey can serve as a better and more reliable source of data for strategic TB planning and resource allocation in Africa and other developing countries.

Keywords: Tuberculosis (TB), millennium development goals (MDGs), directly observed therapy short-course (DOTS), surveillance, social determinants, prevalence survey, developed and developing countries.

INTRODUCTION

UK and Nigeria: Relationships

Nigeria is the most populated developing country in Africa. Nigeria was previously a British colony that achieved political and economic independence on October 1, 1960. However, there are still a number of bilateral co-operations and mutual interactions across various sectors of both economies, including health services. For instance, the UK government (via Department for International Development, DFID) provides support to tuberculosis control programme in Nigeria (USAID, 2011), while the National Tuberculosis and Leprosy Control Programme co-ordinates all partnership activities in Nigeria (USAID, 2011).

In the last 20 to 30 years, tuberculosis (TB) has been increasing in the UK and Nigeria (USAID, 2011; HPA, 2010). The rise in prevalence in Nigeria has been largely due to increased prevalence of HIV/AIDS (Pennap et al., 2010; Chaisson and Martinson 2008) - a deadly combo, in view of aetiopathogenesis, morbidity and mortality of both pathological conditions. On the other hand, the rise in the UK has been mainly attributed to non-UK born migrants and refugees from high incidence countries (mainly Africa and Asia), who often live in disadvantaged communities (inner-city social deprivation) with attendant social risk factors (HPA, 2010; Mor, 2008; Story, 2006; Bhatti et al., 1995). These findings are not really surprising because tuberculosis is a social disease (Mor, 2008; Barnes, 2005).

METHODS

The paper aimed at drawing out inferences from the literature and empirical observations regarding TB as a major public health challenge and its epidemiological context in Africa. Descriptive analyses of TB were done using secondary data on socio-

Table 1. Comparison of Socio-demographic and Health Indices.

Socio-demographics and health indices	Nigeria	United kingdom (UK)
Population (million)	151, 212	61, 231
Population growth (annual) %	2.4	0.5
Gross national income per capita ($)	1,940	36,130
Living in Urban (%)	48	90
Total fertility rate	5.3	1.8
Life expectancy	47.9	80
Infant mortality rate (per 1000 live birth)	96	5
Under - 5 mortality rate (per 1000 live birth)	186	6
Maternal mortality (100,000 pregnancies)	800	7
General government expenditure on health in % of government expenditure (2007)	6.5	15.6
Physician workforce (density/ 10,000 population)	4	21
HIV prevalence (% of population aged 15 to 49)	3.1	0.2

Source- World Health Statistics (2010) at www.who.int/whosis/whostat.

demographic and health indices, as well as core TB profiles between the UK and Nigeria.

RESULTS

Tuberculosis burden

Tuberculosis (TB) is a re-emerging infectious disease throughout the globe (Robert and Buikstra, 2009; Morens et al., 2004). It was declared an emergency in 2005 in Africa because of the alarming rise of new tuberculosis cases (WHO, 2005). The 2009 estimates of the global burden of disease caused by TB showed that there are 9.4 million incident cases, 14 million prevalent cases, 1.3 million deaths among HIV-negatives and 0.38 million deaths among HIV-positives (WHO, 2010). Sadly, the African region accounted for roughly 80% of the 11 to 13% of the incident cases being attributed to HIV infection (WHO, 2010). This statistics suggest the significance and central role of HIV/AIDS in the resurgence and perpetuation of TB. In addition, this underscores the need to further strengthen the integration of TB/HIV programmes globally. However, it is plausible to have underestimated the true burden of the disease in developing countries, given the weak surveillance systems in these (developing) countries where the major burden is occurring.

Given the enormity of disease (TB) burden - being the leading cause of death worldwide with most of the cases and mortality recorded in developing countries, the United Nations via the Millennium Development Goals (MDGs) aimed at stopping the transmission and reversing the 1990 figures of TB by 2015 (WHO, 2010). In addition to this, the Stop TB Partnership has also set more targets which are to halve the prevalence and reduce the mortality rates compared to their levels in 1990 by 2015, as well as to reduce the global incidence of active TB cases to less than 1 case per 1 million population per year (TB elimination) (WHO, 2010). Furthermore, in response to this imminent catastrophe and in order to achieve these targets, the World Health Organisation (WHO) deployed the Directly Observed Therapy Short-Course (DOTS) to stop the TB scourge (WHO, 2010). However, these efforts/strategies can majorly be facilitated or catalysed by adequate and reliable surveillance data. In fact, data on TB prevalence, incidence and mortality are part of the performance indicators for achieving the MDG 6C (halting the spread and reversing the 1990 figures of TB) and WHO Stop TB partnership programmes (WHO, 2010).

Furthermore, the health systems in most developing countries are weak, crippled by poor funding, grossly inadequate trained manpower, poorly motivated staff, economic and political instability and dearth of infrastructures (Travis et al., 2004). These upstream factors together with downstream factors such as discrimination and social stigma associated with TB, illiteracy, poor living conditions (overcrowding and malnutrition), poor health seeking habits and culture, and of course, HIV/AIDS epidemic have made the realisation of the MDGs 6C unrealistic, particularly in the Africa and Asia (Pennap et al., 2010; Chaisson and Martinson, 2008; Raviglione et al., 1997; Barr et al., 2001; Grange, 1995).

Following the literature review in the context of epidemiology, burden and socio-economic links of TB, the defining variables (socio-demographic and health) between Nigeria and the UK were examined as it relates to TB. Table 1 highlights some of the socio-demographic and health indices closely related to TB for the UK (a developed country) and Nigeria (a developing and strategic country in Africa). It can be deduced from Table 1 that Nigeria has a huge population of over 151 million with an annual growth rate of 2.4%, while the UK has a

Table 2. Comparison of TB Profile between Nigeria and UK, 2009.

TB parameters, 2009	Nigeria	United Kingdom (UK)
Mortality (including HIV) per 100,000 population	67	0.57
Prevalence (including HIV) per 100,000 population	497	15
Incidence (including HIV) per 100,000	295	12
Case detection, all forms (%)	94	19
(New Cases) Smear Positive Sputum (%)	52	18
Extra-pulmonary (new cases) %	14	47
Total cases notified	94,114	9,040
% of new TB cases with MDR-TB	1.8	1.0
Treatment success rate (%)	78	78

Source: TB Country Profiles at www.who.int/tb/data.

relatively smaller population of over 61 million and an annual growth rate of 0.5%. Moreover, 48% of the Nigerian population is resident in urban area compared to a predominantly (90%) urban British population. The socio-economic and health indices are quite poor in Nigeria as regard per capita income, life expectancy, infant, under-5 and maternal mortality rates, compared to the robust and strong indices obtainable in the UK. Furthermore, the government spending on health is a mere 6.5% of the total government expenditure, while the UK government despite better health indices still expends 15.6% of the total expenditure on health. Expectedly, the health workforce strength (physician) is grossly lower; 4/10,000 population in Nigeria compared to 21/10,000 population observed in the UK. The prevalence of HIV/AIDS in Nigeria is 15.5 times higher than that of the UK.

From Table 2, the prevalence of HIV/TB is grossly higher in Nigeria than the UK (497: 15 per 100, 000 populations). Similarly, the incidence is much higher in Nigeria (295/100,000 population) than the UK rate of 12/100,000 population. Mortality due to the duo is grossly higher in Nigeria (67/100,000 population) than the UK with a much lower rate of 0.57/100,000 population. Case detection for all forms of TB is also higher in Nigeria than the UK- 94% and 19% respectively. Even though, higher percentage of new cases of extra-pulmonary TB is detected in the UK than Nigeria - 47 and 14%, respectively. In consistent with other figures, 52% of new cases are smear positive in Nigeria compared to 18% obtainable in the UK. In addition, 94,114 cases of TB were reported in Nigeria in 2009 while only 9,040 were reported in the UK. There is very slight difference in the percentages of new TB cases with multi-drug resistant TB of 1.8: 1, while there is no difference in the success rate of treatment in both countries. Meanwhile, it should be noted that the aforementioned data may not be accurate, especially that of Nigeria, because of weak reporting system, poor data management and difficulty in accessing health care services, especially in remote part of the country.

Tuberculosis surveillance programme in the UK: A worthwhile example

Surveillance for tuberculosis is dated back to late 19th century, which was entirely crude record of deaths. However, data for clinically diagnosed tuberculosis have been available for about a century (1913) in England (HPA, 2010). This surveillance system got strengthened in 1994 when the UK Mycobacterial Network (MycobNet) was instituted - a UK-wide network of reference laboratories and national tuberculosis surveillance team, aimed at monitoring all laboratory confirmed cases of TB in a database (HPA, 2010). This system became more elaborate (containing clinical and demographic details) in 1999 when Enhanced Tuberculosis Surveillance (ETS) was designed to match or link data to MycobNet database yearly (HPA, 2010).

The Chief Medical Officer's Publication of 2004 on the National Tuberculosis Action Plans (DOH, 2004) led to the advent of an (UK-wide) electronic enhanced surveillance system (which incorporates clinical and laboratory surveillance system), though, this had been in existence since 2002 (HPA, 2010). As part of the MycobNet network, information (including specie, drug susceptibility and some clinical and minimal socio-demographic data) on *Mycobacterium tuberculosis* complex isolate is obtained from seven reference laboratories in the UK (HPA, 2010). Data received from reference laboratories are cleaned. The cleaned data are then matched to the ETS data set through a computerised matching process based on patient identifier common to both systems, thereby raising the data quality (HPA, 2010). Unfortunately, this process is only being done at the national level at the moment.

The linkage of reference laboratory data to cases reported via Enhanced Surveillance of Mycobacterium Infections (ESMI) is managed by Health Protection Scotland (HPA, 2010). Treatment can now be reported directly to the web-based ETS or via a form filled by clinicians or nurses (HPA, 2010). The Enhanced Surveillance of Mycobacterium Infections (ESMI) does

clinical surveillance for TB in Scotland in conjunction with each National Health Service Board Public Health Team, which notifies and complete questionnaires that are then forward to Health Protection Scotland. Health Protection Scotland, in turn, collates and updates continuously the information at the national level and then report findings annually (HPA, 2010). The system attributes of evaluating surveillance using the Centre for Disease Control Framework (CDC) (simplicity, flexibility, data quality, acceptability, sensitivity, timeliness, representativeness and stability) suggest relatively strong and efficient system based on reviewed literature (HPA, 2010; Mor et al., 2008). Therefore, this approach can be an operational model worthy of emulation by African countries. However, this working model must be complemented by other factors such as well as trained health work force, better health financing, improved service delivery, appropriate technology as well as good governance and leadership.

DISCUSSION

Tuberculosis profile

Nigeria has a huge burden of TB/HIV compared to the much lower burden in the UK. This finding is not unexpected in view of the socio-economic conditions and HIV/AIDs epidemic. This scenario is similar to what is obtainable in many developing countries, even though there are some national variations. There are higher percentages of extra-pulmonary TB cases in the UK than Nigeria - this may be explained by availability of better diagnostic facilities in the UK, hence a reduced likelihood of missed diagnosis and under-reporting. On the other hand, there is higher likelihood of continuous TB transmission in Nigeria, given the high percentage of new sputum smear positive cases, poor case detection rate, poor socio-economic conditions and appalling health indices. This is opposite to the robust economic and health indices, lower sputum smear positive cases and relatively sensitive surveillance system in the UK. This scenario in Nigeria may explain why TB rate has snowballed in many African countries and by extension, the developing world.

Socio-economic and political determinants

Nigeria is a lower-middle income country with the majority living below poverty line, whereas the UK is a wealthy nation with high per capita income (WHS, 2010). Essentially, TB is an ailment of poverty (Spence, 1993; Barr et al., 2001) and this is evident in both countries with respect to the class of people being affected and also the burden of the disease. Nigeria has enormous ingredients needed for TB transmission compared to the UK. It must be emphasised at this point that the developing countries can learn from the UK experience (and other developed countries), which is well documented in the literature concerning the decline in the incidence of TB before the advent of effective chemotherapy. The spread of TB can be effectively curtailed by adopting the basic public health strategies which can be complemented by the WHO DOTS strategy (Grange, 1995). In other words, improving the living conditions of the people, (dealing with overcrowding in public places and better housing conditions, improved nutrition), eradicating poverty and education can be a veritable preventive strategy as well as prompt diagnosis and treatment anchored on surveillance and strong health systems.

Significant attention has been focused on chemotherapeutic strategy (bio-medical model of health) at the expense of other health promoting and preventive strategies, particularly in developing countries where there are ample conditions that enhance the spread of TB.

Furthermore, the Nigerian government has not demonstrated serious political will in addressing poverty, unemployment, poor housing, energy crises, educational collapse, environmental challenges and generalised institutional decay. All these aforementioned challenges directly or indirectly encourage the perpetuation of this social disease - TB. It can therefore be argued that the major challenges with the elimination of TB in the developing world lies outside the health care services. It emanates and is sustained by the (adverse) socio-economic determinants of health which are quite appalling in Africa and other developing countries.

Health care services

The health systems and healthcare financing seem poor in spite of apparent need for improved financing in Nigeria and other developing countries (WHS, 2010). Corruption is not limited to the politicians and leaders in power but extends to other spheres of public services, including the health sector, such that the meagre budgetary allocations to health are not judiciously utilised. The staffs offering the basic medical services are poorly motivated, under pressure from excessive work load, infrequently re-trained, and there are also serious challenges as to geographical access to health care services (WHS, 2010; Grange, 1995), especially in the rural areas- “inverse care law”. All these adversely affect the “quality and quantity” of health and health care services in developing countries. Interestingly, the health care service is also an indication of socio-economic development of a country (Grange, 1995; Chudi, 2010), thus further strengthening the explanation for the perpetuation of TB (a disease of poverty) in the developing world.

On the positive side, HIV/AIDS seems to have

strengthened human and laboratory capacities at different levels in both countries as well as increasing the case detection rate (increased screening and clinical suspicion), given the association between the two pathologies and the integrated approach being recently adopted in their management.

The need for national prevalence surveys

The surveillance system in most African nations, a part of the health system is incapable of capturing the true burden of the disease and invariably cannot be used to monitor the progress (or retrogression) being made in the realisation of the MDGs. Therefore, for the MDGs 6C to be objectively defined and monitored with the hope of its realisation, periodic national prevalence surveys are warranted, particularly in the African region. To date, only two African countries in last 5 decades have been able to complete a nationwide TB prevalence survey- Eritrea in 2005 (Sebhatu et al., 2007) and Ethiopia in 2011 (WHO, 2011).

Furthermore, The Gambia has recently commenced a national survey designed for completion by the end of 2012 (GAMSTEP, 2012). Such national surveys, if well conducted, will provide reliable data on TB impacts unearth undetected TB cases in the community, including spatial distribution of the disease, may inform national TB policy review, TB finance and resource allocation. Other related conditions such as HIV/AIDS and relevant variables depending on national needs can also be investigated using such surveys. However, inadequate technical know-how, very limited experience (high human capacity demand) and high cost are some of the factors that may be hampering the replication and conduct of such survey in many African countries and by extension the developing world (Sebhatu et al., 2007). Furthermore, high level of corruption and poor political will may also be important impediments, as donor agencies tend to be sceptical about judicious use of huge funds needed for such projects.

Conclusion

The MDGs (1 and 6) is a step in the right direction, given the relationship between poverty and TB. However, more pragmatic effort has to be put in place to alleviate poverty and social exclusion in Africa, as well as ensuring that other upstream factors (political willingness, politico-economic stability, food security, social infrastructures and energy) are co-ordinated and in tandem with DOTS partnership plan. In other words, the DOTS strategy (medical model) should be complemented with other health promoting programmes (social welfarist) as it is well documented in the literature that health care or chemotherapy alone does not make health. Furthermore, the international community in conjunction with governments of developing countries should aim at improving the living and working conditions (easing overcrowding and better housing), environmental sanitation, good nutrition, as well as addressing the upstream factors, which adversely affect “quality and quantity” of health and health care services.

The literature and empirical observations also suggest that surveillance is weak and ineffective in most African countries (compared to Europe); therefore data generated from this part of the world are unreliable and less useful for strategic TB planning and financing. The surveillance approach in the UK can be understudied and adopted in the African region and other developing regions, as it is performing well amidst challenges. Hence, for the MDGs to be realised particularly in Africa, and given the importance of good surveillance data, a national TB prevalence survey is warranted in these settings. Although difficult, given the circumstance in the developing world, a national prevalence survey will provide better and more reliable data for planning and resource allocation, better understanding of the epidemiology as well as progress monitoring, when done at appropriate intervals and more importantly, if well conducted.

REFERENCES

Barnes DS (2005). The making of a social disease - tuberculosis in the nineteenth-century France, University of California Press; Berkeley and Los Angeles.

Bhatti N, Law MR, Morris JK, Halliday R, Moore-Gillon J (1995). Increasing Incidence of Tuberculosis in England and Wales: A study of the Likely Causes. BMJ, 310: 967.

Barr RG, Diez-Roux AV, Knirsch CA, Pablos-Mendez A (2001). Neighbourhood Poverty and the Resurgence of Tuberculosis in the New York, 1984 – 1992. Am. J. Pub Health, 21(9): 1487-1493.

CDC Update Guidelines for Evaluating Public Health Systems-Recommendation from Guideline Working Group. www.cdc.gov/mmwr/preview/mmwrhtml/rr5013a1.htm. Accessed 27th March, 2011.

Chaisson RE, Martinson NA (2008) Tuberculosis in Africa- Combating an HIV- Driven Crisis. NEJM, 358: 1089- 1092

Chudi IP (2010). Healthcare problems in developing countries. Med. Pract. Rev., 1(1): 9-11.

Department of Health. Stopping Tuberculosis in England: An Action Plan from the Chief Medical Officer. 2004. London, Dep. of Health.

Ethiopian National TB Prevalence Survey 2010-2011 Preliminary Results. http://www.who.int/tb/advisory_bodies/impact_measurement_taskforce/meetings/lille_oct11_ethiopia.pdf. Accessed 1st March, 2012

Grange JM (1995). The Global Burden of Tuberculosis. In: Porter, J.D.H and Grange, J.M., editors. Tuberculosis: An Interdisciplinary Perspective. London. Imperial College Press.

Koo D, Wetterhall SF (1996). History and current status of the National Notifiable Diseases Surveillance System. J. Pub. Health Manag. Pract., 2: 4-10 .

Mor Z, Migliori GB, Althomsons SP, Loddenkemper R, Trnka L, Iademarco MF (2008). Comparison of tuberculosis surveillance systems in low- incidence industrialised countries. Eur. Resp. J., 32(6): 1616-1624.

Morens DM, Folkers GK, Fauci AS (2004). The Challenge of Emerging and Re-emerging Infectious Diseases. Nature, 430: 242- 249.

Pennap G, Makpa S, Ogbu S (2010). Sero-prevalence of HIV among

Tuberculosis Patients in A Rural Tuberculosis Referral Clinic in Northern Nigeria. PanAfr. Med. J., 5(22): 1-4

Raviglione MC, Harries AD, Msiska R, Wilkinson D, Nunn P (1997). Tuberculosis and HIV: current status in Africa. Int. J. T. Lung D. AIDS. 11 (SupplB): S115-23.

Robert CA, Buikstra JE (2009). The Bioarchaeology of Tuberculosis: A Global Perspective on a Re-emerging Disease. University Press of Florida. Gainesville,Fl.

Sebhatu M, Kiflom B, Seyoum M, Kassim N, Negash T, Tesfazion A, Borgdorff MW, van der Werf MJ (2007). Determining the burden of Tuberculosis in Eritirea: a new approach. Bull. World H. Org., 85: 59-599.

Spence DPS, Hotchkiss J, Williams CSD, Davies PDO (1993). Tuberculosis and Poverty. BMJ, 307: 759- 761.

Story A., van Hest R, Hayward A (2006). Tuberculosis and Social Exclusion. BMJ, 333: 57 doi: 10.1136/bmj.333.7558.57.

The Gambia Survey of Tuberculosis Prevalence (GAMSTEP). http://www.mrc.gm/events/the-gambia-survey-of-tuberculosis-prevalence-gamstep. Accessed 1st March, 2012.

Travis P, Bennett S, Haines A, Pang T, Bhutta Z, Hyder AA, Pielemeier NR, Mill A, Evans T (2004). Overcoming health-systems constraints to achieve the Millennium Development Goals. Lancet, 364(9437): 900-906.

Tuberculosis Profile for Nigeria- United States Agency for International Development. www.usaid.gov/our_work/global_health/id/tuberculosis/countries/africa/nigeria.pdf. Accessed 25th March, 2011.

Tuberculosis in the UK: Annual report of tuberculosis surveillance in the UK, 2010. London: Health Protection Agency Centre for Infections, October 2010. www.hpa.org.uk/web/HPAwebFile/HPAweb_C/1287143594275. Accessed 25th March, 2011.

World Health Statistics. **www.who.int/whosis/whostat**. Accessed 27th March, 2011.

World Health Organisation (2010). Millennium Development Goals (MDGs) www.who.int/topics/millennium_development_goals/about/en/index/html. Accessed 28th March, 2011.

World Health Organisation. Global Tuberculosis Control: A Short Update to 2009 Report. Geneva, Switzerland.

World Health Organisation. WHO declares TB and emergency in Africa-Call for “urgent and extra-ordinary actions” to halt worsening epidemic. www.who.int/mediacentre/news/releases/2005/africa_emergency/en/index.html. Accessed 26th March, 2011.

WHO Report 2010 Global Tuberculosis Control. WHO Press; WHO, Geneva, Switzerland 2001; 21(9): 1487-1493.

Journal of Public Health and Epidemiology Vol. 4(6), pp.156-169, June 2012
Available online at http://www.academicjournals.org/JPHE
DOI: 10.5897/JPHE12.012
ISSN 2141-2316 ©2012 Academic Journals

Full Length Research Paper

Waste management options for health care wastes in Nigeria: A case study of Port Harcourt hospitals

David N. Ogbonna[1]*, Alex Chindah[2] and Ndubuisi Ubani[3]

[1]Department of Applied and Environmental Biology, Rivers State University of Science and Technology, Nkpolu-Oroworukwo, P. M. B. 5080, Port Harcourt, Nigeria.
[2]Institute of Pollution Studies, Rivers State University of Science and Technology, Nkpolu-Oroworukwo, P. M. B. 5080, Port Harcourt, Nigeria.
[3]Institute of Geosciences and Space Technology, Rivers State University of Science and Technology, Nkpolu-Oroworukwo, P. M. B. 5080, Port Harcourt, Nigeria.

Accepted 16 March, 2012

This study was undertaken to identify the waste disposal options adopted by the different hospital authorities in managing wastes generated as well as determining their awareness level on hospital waste management issues. A daily waste inventory study of each hospital department was carried out for six months in five different hospitals as representative healthcare institutions in Port Harcourt, Nigeria to estimate the waste types and quantities generated. Results obtained showed that 5.53 kg of hazardous portions of hospital wastes and 20.4 kg of non-hazardous waste portions were generated per day by the three categories of hospitals. The waste composition obtained for the different hospital categories show a positive linear relationship between and among the categories of hospitals and the wastes they generate. The findings further show that all the hospitals fell below the recommended waste management practices as prescribed by the World Health Organization and other regulatory authorities. Wastes were not segregated into marked or colour coded containers/bins for the different waste streams neither do they keep records of waste generation and disposal. Recommendations are made for training of personnel on waste handling and provision of safety gadgets and proper education on waste reduction strategies. This process will ensure a reduction in the quantity of medical waste generated which is more expensive to manage.

Key words: Healthcare wastes, health workers, infectious diseases, waste disposal, waste management, hospitals.

INTRODUCTION

Port Harcourt as a fast growing capital city of Rivers State, like most developing cities, lack the infrastructural wherewithal; human and financial resources as well as the institutional capacity necessary to effectively manage hospital/medical wastes as part of the general effort to enhance the protection of human life and the general environment from health hazards arising from improper management of hospital hazardous waste. Waste management entails the process of generation, proper and effective collection, transportation, and disposal of wastes in establishments. Consequently, effective management of hospital waste does not only involve the generation/collection and removal of wastes from hospital premises. It also includes the effective and environmentally safe manner of disposing the wastes.

Management of healthcare wastes (HCW) should be considered as an integral part of hospital hygiene and infection control. The HCW generated within a healthcare facility should always follow an appropriate and well identified stream from their point of generation until their final disposal. This stream is composed of several steps that include generation, segregation, collection and onsite

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

transportation, on-site storage, offsite transportation and finally on or offsite treatment and disposal. The poor segregation, handling and disposal practices of many hospitals, clinics and health centres are likely representatives of practices throughout Nigeria and pose serious health hazards to people living in the vicinity of healthcare institutions. A set of protective measures should also be developed in relation with the handling and treatment/disposal of healthcare waste. It is reported that health care institutions dispose of all wastes to municipal dumpsites without pre-treatment, leading to an unhealthy and hazardous environment around the health institutions, affecting patients, staff and the community (Ferreira and Veiga, 2003; Da Silver et al., 2005; Tudor et al., 2005; Ndidi et al., 2009; Abah and Ohimain, 2011; Ogbonna, 2011). Waste management and treatment options should first protect the healthcare workers and the patients and minimize impacts on the environment.

However, the nature and quantity of healthcare waste generated as well as the institutional practices with regards to sustainable methods of healthcare waste management including waste segregation and waste recycling are poorly examined and documented in our healthcare institutions despite the health risks posed by improper handling of healthcare wastes (Ubani, 2004; Oke, 2008; Farzadika et al., 2009; Adegbita et al., 2010).Contamination of water supply from untreated healthcare waste can also have devastating effects. If infectious stools or bodily fluids are not treated before being disposed of, they can create and extend epidemics, since sewage treatment in Africa is almost nonexistent (Rhodes et al., 2000). For example, the absence of proper sterilization procedures is believed to have increased the severity and size of cholera epidemics in Africa during the last decade.

Carl and Janis (1993) reported that most waste disposal sites are required by law to have environmental pollution prevention and control technologies. Available records on the quantity and nature of HCWs and the management techniques in our institutions, with respect to adequate disposal techniques of these wastes have remained a challenge in many developing countries of the world. However, it is reported that several hundreds of tonnes of HCWs are deposited in open dumpsites untreated alongside non hazardous solid wastes (Alagoz and Kocasay, 2007; Abah and Ohimain, 2010) which now poses health risks to health workers, cleaning staff, patients, visitors, waste collectors, disposal site staff, waste pickers, drug addicts and those who knowingly or unknowingly use “recycled” contaminated syringes and needles. Therefore, hospital wastes should be managed in such a way as to protect the health and safety of the personnel generating or transporting hospital/clinical wastes, the public and all aspects of the environment. This study was undertaken to identify the lapses or gaps associated with the handling of HCWs in our health institutions in Nigeria compared with the international best practices and current technologies to safeguard the health of the community.

MATERIALS AND METHODS

Sampling procedure

Five hospitals in Port Harcourt metropolis were randomly selected as a representative of the health care institutions in the area. Sampling was conducted for a period of 6 months to determine the effectiveness of hospital waste management practices. The hospitals were grouped into 3 categories namely large, medium and small, and due cognizance of privately and publicly/government owned hospitals were noted. In this study, the University of Port Harcourt Teaching Hospital (UPTH) represents the Teaching hospitals, Braitwaithe Memorial (BMH) hospital is government owned general hospital while St. Patrick Hospital represents a specialist home. Others were multinational company hospitals, such as the Shell Petroleum Development Company (SPDC), Agip and Elf oil companies, which were located variously in their areas of operation for their staff and host communities and finally Orogbun health Center in Ogbunabali, Port-Harcourt was classified for this study as representing primary health centers. The selected hospitals were carefully chosen to ensure geographical spread, and for adequate representation of large, medium, small sized hospitals in the survey. Also within the selected hospitals due cognizance of privately and public owned were noted. The scaling of hospitals to large, medium and small was based on bed space, bed occupancy rate, wards/units, staff strength and patients.

Sampling was carried out for each category and vital information included nature of waste generation and disposal methods for both solid and liquid wastes. Data were obtained by administering questionnaires to hospital staff such as consultants, medical officers, paramedics (matrons, nurses, cleaners, pharmacists), and administrative personnel. The questionnaires were designed in such a way as to enable respondents indicate wastes types generated and disposal methods. The questionnaire was structured to generate data on the following:

1. Various sources of wastes in the hospital
2. Type of waste collected and handled
3. Safety of personnel and personnel handling waste
4. Adequacy of the protective wear provided
5. Current waste handling methods/procedures
6. Transportation, treatment, and waste disposal methods/ procedures.
7. Existing waste management system.
8. Awareness of hospital staff on waste management.

Each of the hospitals was provided with polythene waste bags with which waste generated were collected daily. The next day, the bags were collected, sorted into categories and the weight of various wastes were determined by using a weighing balance. This was done with the assistance of cleaners and nurses who gather all the solid wastes generated per day in a central waste bin from where the wastes were sorted into categories and weighed using the Ohaus Dail Spring Scale. The composition of the wastes from sampled hospital was estimated by sorting into five categories namely:

1. Plastics, PVC and syringes
2. Swabs, pads, gauze and absorbents
3. Paper packages and bottles
4. Sharps/needles
5. Kitchen/food wastes

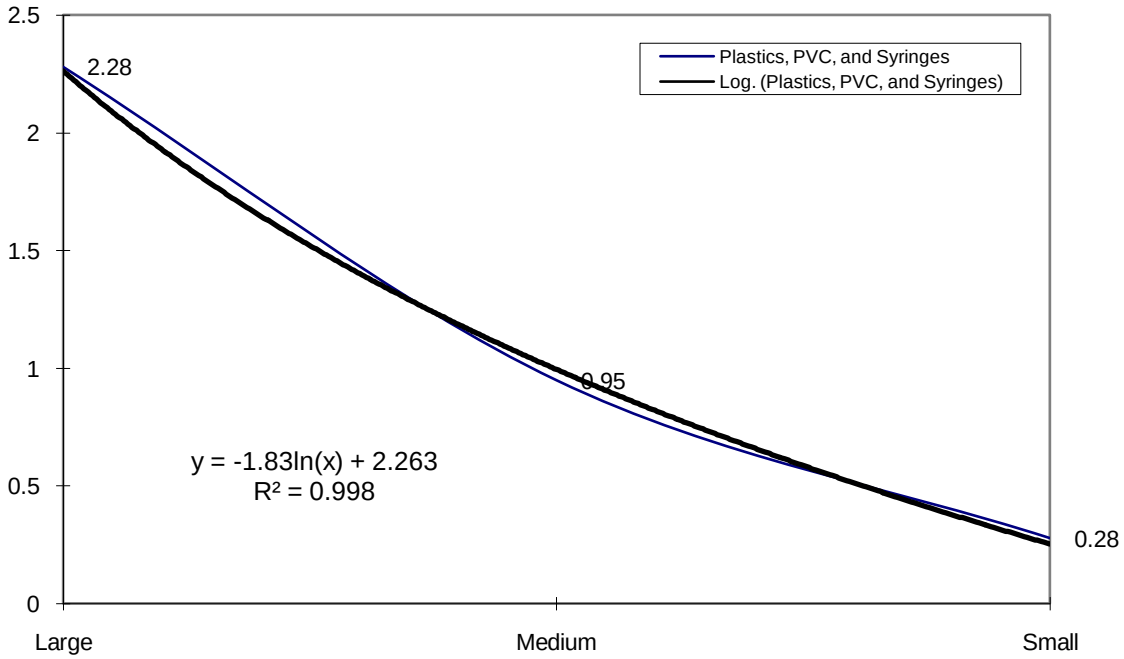


Figure 1a. Relationship between waste type generation and hospital category (Plastic, PVC and syringes weighed in kg). Vertical axis: Hospital Category; Horizontal axis: Quantity of waste type generated.

Calculations of the average quantity of waste per bed per day were then carried out by dividing the quantity of waste by the number of beds in the unit (WHO, 2002; UNEP/WHO, 2005).

Statistical methods were used to analyze the data generated from respondents to the structured questionnaires and direct observation was made on the waste handling at each hospitals. However, simple percentages (%) were converted to arcsines in order to remove the binomial nature of the data. Data collected were tested using analysis of variance. Tables, graphs and other non-parametric descriptive tools were equally used in interpreting the data.

RESULTS

The results obtained from the study showed that both hazardous and non hazardous wastes are generated by the three category hospitals. The result of the survey using a set of questionnaire revealed that about 5 .53 kg of solid hazardous wastes and 20.4 kg of non-hazardous wastes are generated by the three category hospitals sampled per day. Statistical (natural log) analysis of the hospital waste types and quantity showed a positive linear relationship between and among the three categories of hospitals and the wastes they generate (Figure 1a to e). It is evident from the result that large hospital contributes more to waste of different composition as compared to medium and small size hospitals in the order of large hospital (17.66 kg/day) > medium hospital (7.89 kg/day) > small hospital (2.36 kg/day) (Table 1). Thus the quantity and composition of wastes generated followed a downward trend.

Awareness on keeping record on wastes generated

Record keeping on wastes generated in large hospitals indicated that 58% of hospitals were aware of recording waste streams from their areas of operation while 32% of the hospitals are not aware of record keeping as a management practice (Figure 2a).In the contrary, 51% of medium hospitals are not aware of keeping record of wastes generated in their facilities, whereas 39% of them are aware of keeping records of wastes generated (Figure 2b). It was also observed that a low proportion of 8% are indifferent in record keeping of wastes generated. Amongst the small hospitals, only 10% are aware of keeping record of wastes generated (Figure 2c), the greater proportion of hospitals (84%) are not aware of keeping record of wastes generated in their hospitals. This scenario makes it difficult to track hazardous wastes content in the waste generated in this category of hospitals. It is therefore obvious that awareness on keeping record of wastes generated by small hospitals is low. The two-factor analysis of variance of awareness on keeping record of wastes generated by the three hospital categories shows no significant difference at 0.05 level of significance among the hospitals.

Awareness on waste segregation practice

Large hospitals were observed not to use colour-coded bags/bins to segregate and store wastes before disposal.

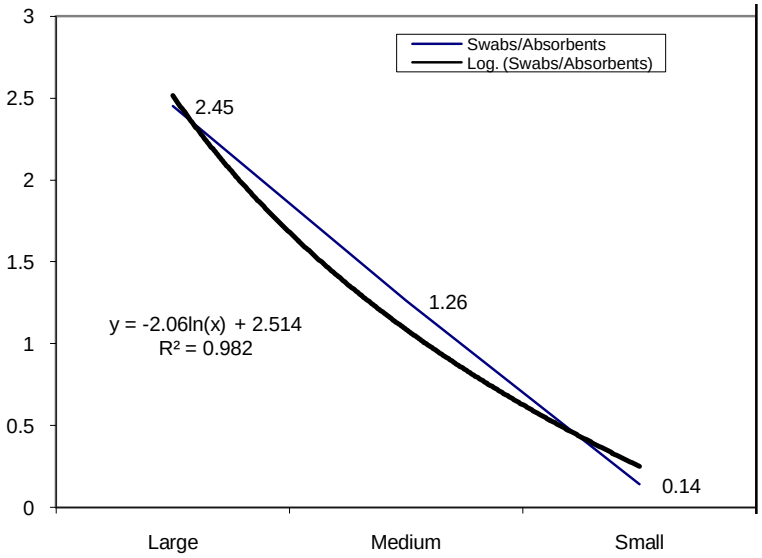


Figure 1b. Relationship between waste type generation and hospital category (Swabs and absorbents weighed in kg). Vertical axis: Hospital Category Horizontal axis: Quantity of waste type generated.

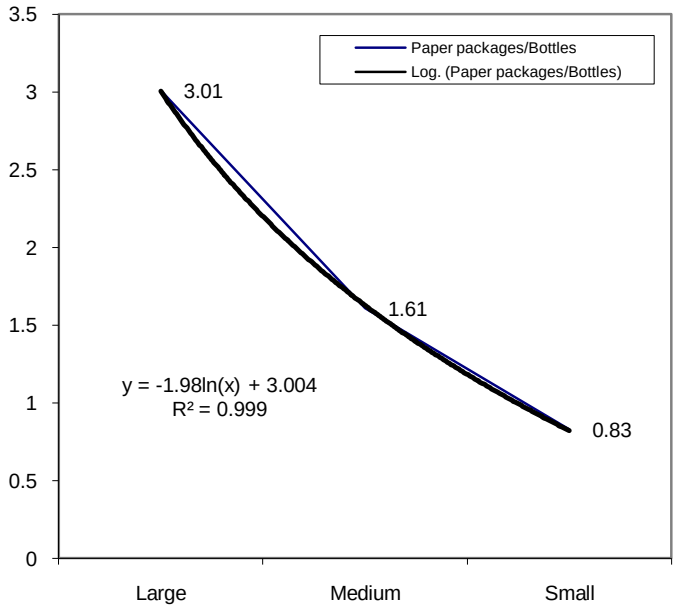


Figure 1c. Relationship between waste type generation and hospital category (Paper packages and Bottles weighed in kg). Vertical axis: Hospital Category; Horizontal axis: Quantity of waste type generated.

This is evident from the larger proportion of respondents (53%) that do not use colour-coded bags to segregate and store wastes. It was also observed that 26% of respondents are aware of the use of color- coded bags/bins, while 21% of respondents are indifferent on the use of color-coded bags/bins in waste management (Figure 3a). Medium hospitals (52%) were observed to show similar respondent pattern as observed with the large hospitals (Figure 3b). Only 14% of respondents indicated awareness on the use of colour-coded bags/bins for wastes segregation, while 34% of respondents are indifferent on the use of colour- coded bags/bins.

Small hospitals also showed no awareness on the use of colour-coded bags/bins in waste management. Thus the three categories of hospital exhibited obvious low

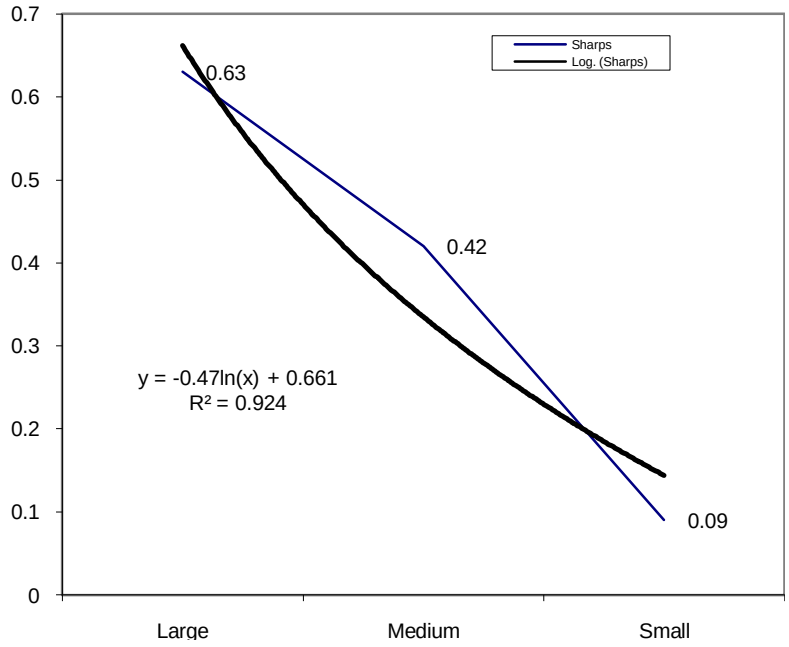


Figure 1d. Relationship between waste type generation and hospital category (Sharps weighed in kg). Vertical axis: Hospital Category Horizontal axis: Quantity of waste type generated.

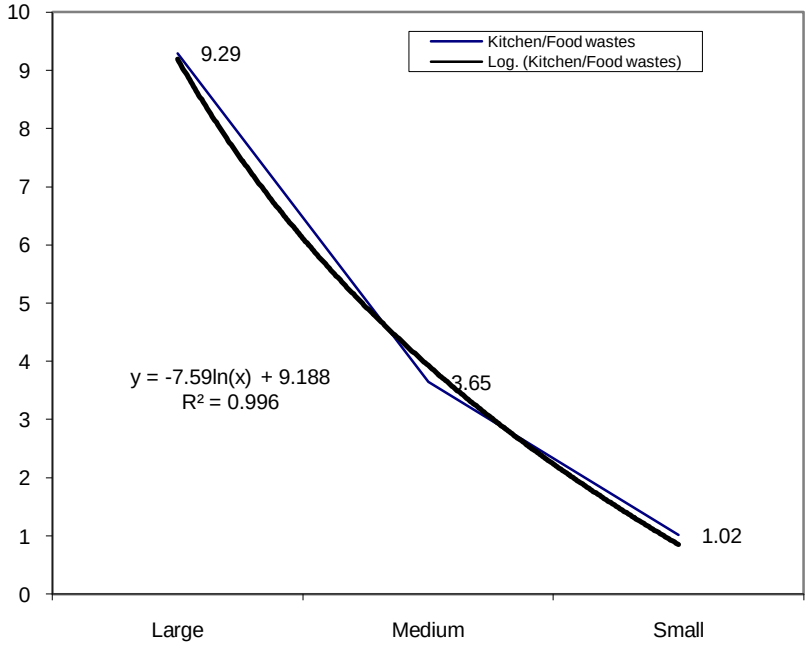


Figure 1e. Relationship between waste type generation and hospital category (Kitchen and Food weighed in kg). Vertical axis: Hospital Category Horizontal axis: Quantity of waste type generated

awareness level in the use of colour- coded bags/bins in waste management (Figure 3c).The analysis of variance of awareness on waste segregation by the three hospital categories shows a significant difference at 0.05 level of significance among the hospitals.

Use of trained personnel in handling waste

The use of trained personnel in waste handling varied between the hospitals categories. Greater proportion of hospital waste was handled by trained personnel in the

Table 1. Average solid daily waste generation rates (kg) from selected hospitals in Port Harcourt metropolis.

Waste description	Hospital category		
	Large	Medium	Small
Plastics, PVC, and syringes (kg/day)	2.28	0.95	0.28
Swabs/absorbents (kg/day)	2.45	1.26	0.14
Paper packages/bottles (kg/day)	3.01	1.61	0.83
Sharps (kg/day)	0.63	0.42	0.09
Kitchen/food wastes (kg/day)	9.29	3.65	1.02
Total waste stream (kg)	17.66	7.89	2.36

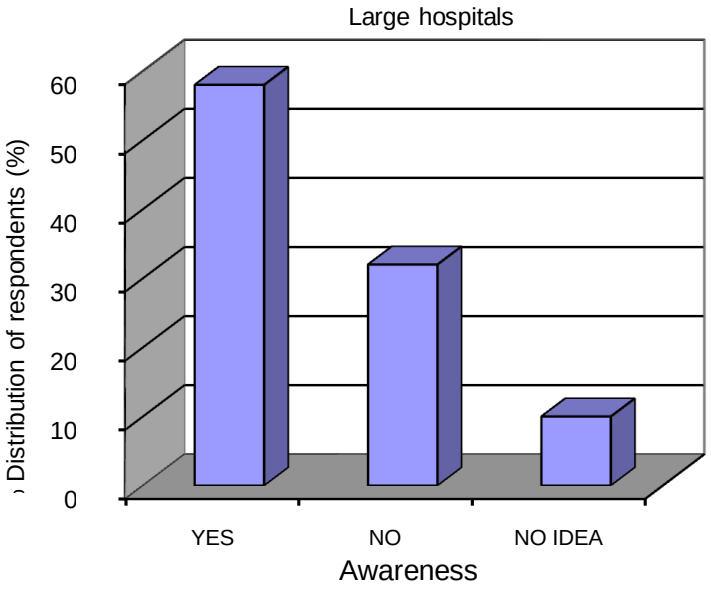


Figure 2a. Relative awareness by large hospitals on keeping record of wastes generated.

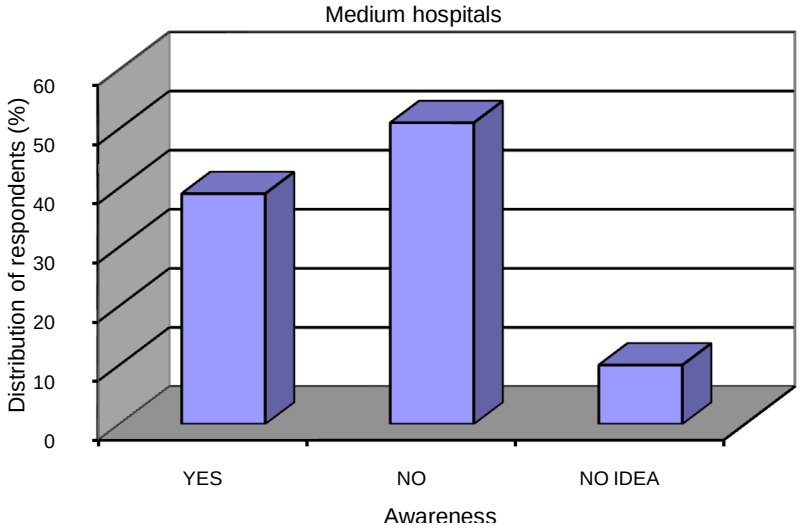


Figure 2b. Relative awareness by medium hospitals on keeping record of wastes generated.

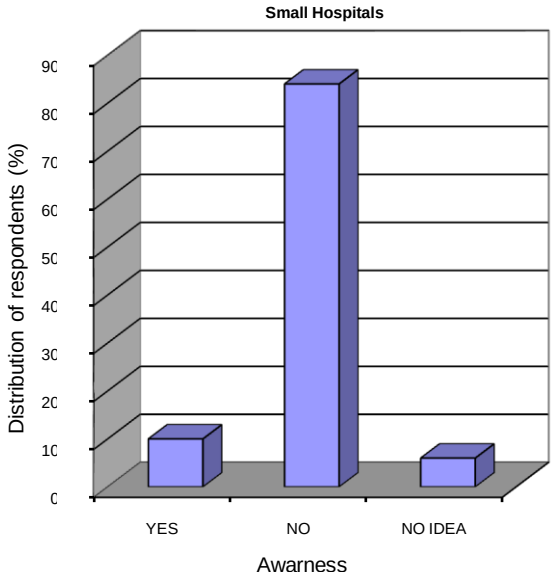


Figure 2c. Relative awareness by small hospitals on keeping record of wastes generated.

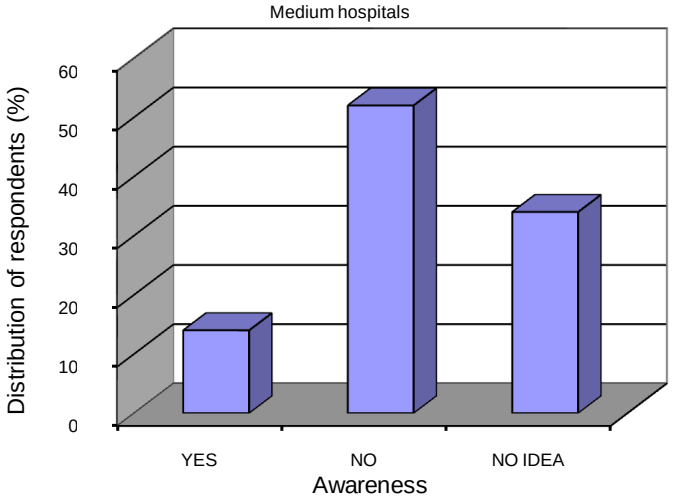


Figure 3b. Relative awareness on waste segregation by medium hospitals.

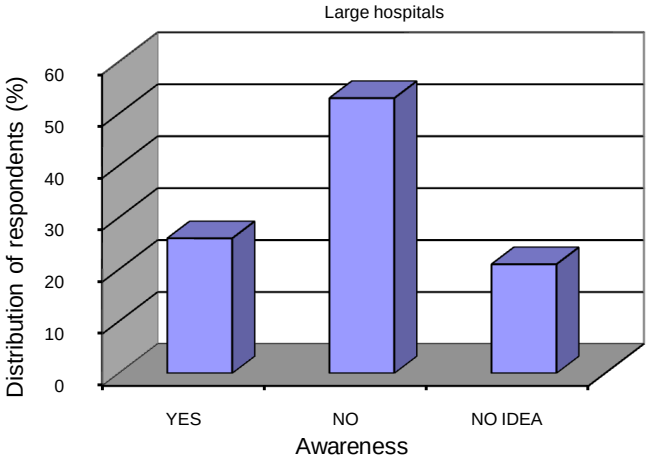


Figure 3a. Relative awareness on waste segregation by large hospitals.

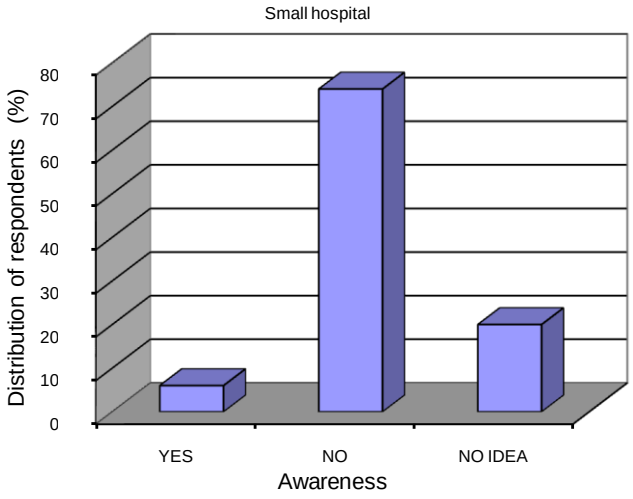


Figure 3c. Relative awareness on waste segregation by small hospitals.

large hospitals (Figure 4a). The proportion that felt otherwise (28%) was double fold less than those who are aware (55%). In the medium and small scaled hospitals (Figure 4b and c), the revise pattern was observed. In the same way, the analysis of variance of awareness on the use of trained personnel in waste handling by the three hospital categories shows no significant difference at 0.05 level of significance.

Awareness on existing guidelines/legislations on waste management and compliance

The three categories of hospitals showed high level of awareness of some existing guidelines/legislations for industrial hazardous and medical wastes handling. Awareness level on the existence of Harmful Wastes Act, Cap 165 LFN 1990, was in the decreasing order of large hospitals greater than the medium hospitals greater than the small hospitals (LH > MH > SH) (Figure 5). The statistical test for awareness level on existing guidelines/ legislations on waste management and compliance among the three category hospitals shows no significant difference, at 0.05 level of significance.

Provision of safety gadgets to staff in waste handling

It was observed that in large hospitals, safety gadgets

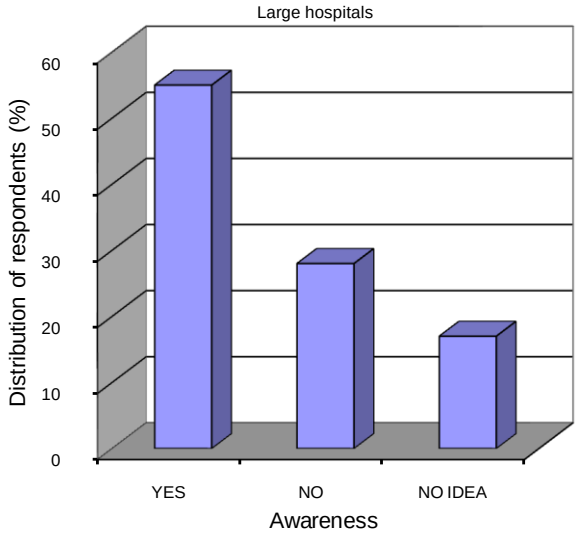


Figure 4a. Awareness by large hospitals on the use of trained personnel in waste handling.

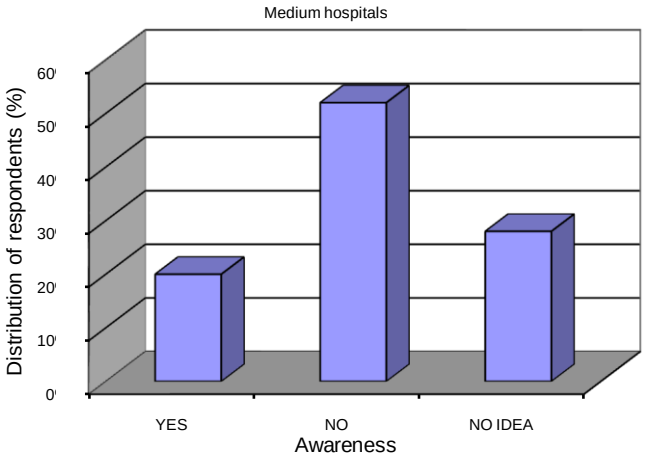


Figure 4b. Relative awareness by medium hospitals on the use of trained personnel in waste handling.

were provided and in the ordering magnitude of hand gloves (48%), coverall (27%), safety boots (12%), with 33% of respondents indicating the provision of all safety gadgets listed for waste handling (Figure 6a). In the medium hospitals (Figure 6b), provision of safety gadgets to staff in waste handling is in the decreasing order of coverall (35%) greater than hand gloves (31%), greater than safety boots (10%), greater than nose mask (0%), and eye goggles (0%). It was observed that nose mask and eye goggles are not used in waste handling by medium hospitals. Small scale hospitals (Figure 6c) also had provision of safety gadgets in the decreasing order of hand gloves (59%), coverall (14%), and nose mask (9%). Small hospitals were also observed to show similar respondent pattern as observed with medium hospitals in the use of safety boots and eye goggles in waste handling. Generally, results from the three categories of hospital showed that eye goggle as a safety gadget, was not used in waste handling. The statistical test for comparing provision of safety gadgets to staff among the three categories of hospitals show a significant difference in the provision of safety gadgets to staff in the three categories of hospitals.

DISCUSSION

A major issue confronting the management of healthcare waste is perhaps the fact that it is generally viewed mainly from an environmental and less from a public health perspective. In Nigeria, liability for any pollution occurring as a result of unauthorized waste management activities rests with the waste generator in accordance with Article 20(1) of Decree No 58/88. The Public Health Act 1958 and various state edicts on environmental sanitation also provide regulation on the management of solid waste, particularly non hazardous, general (municipal) waste. These laws however do not adequately address the important aspects of healthcare waste. A mechanism to regulate and enforce sustainable management of wastes generated from healthcare as an Integral part of the existing environmental protection framework should be considered.

The current disposal method of hazardous wastes in the healthcare institutions studied, that is dumping and opens burning within the premises of hospitals poses health risk to patients and people residing close to healthcare facilities (Kuroiwa et al., 2004). The HCW may contain a large proportion of plastics (as recorded in this study), when burnt emits dioxin which is a major air pollutant of concern from chlorinated polymer (WHO, 2004). Improperly disposed hazardous HCW (like syringes and needles in the absence of sterilization) can cause infectious of Hepatitis B, C and HIV (WHO, 2002) and poses indirect risks to humans through direct environmental effects by contaminating soil and groundwater (Abah and Ohimain, 2011). This observation is consistent with several studies (Allsopp et al., 2001; Echegaray et al., 2002; Ndidi et al., 2009 Ogbonna, 2011). This is orchestrated by the fact that when untreated wastes are beaten by rain are washed into the drainages, rivers, streams and other waters thus endangering human and aquatic lives (Ogbonna et al., 2007). The concern about hazardous wastes may differ or have similar outcomes. This is because the harmful effects of some wastes may not be obvious while being used and /or before they are discarded. For instance, people could get exposed during a product manufacturing process, transportation, distribution and/ or usage. Most chemicals and cytotoxic drugs are good examples of products that are harmful throughout their lives' cycle and disposal.

From the results on record keeping on waste generated

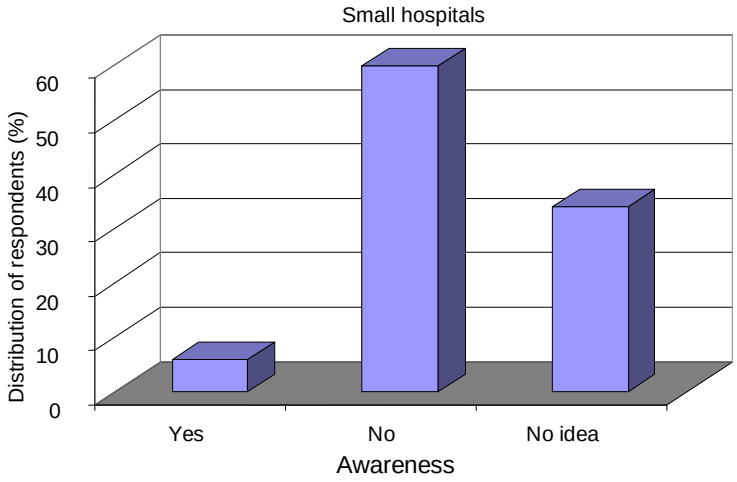


Figure 4c. Relative awareness by small hospitals on the use of trained personnel in waste handling.

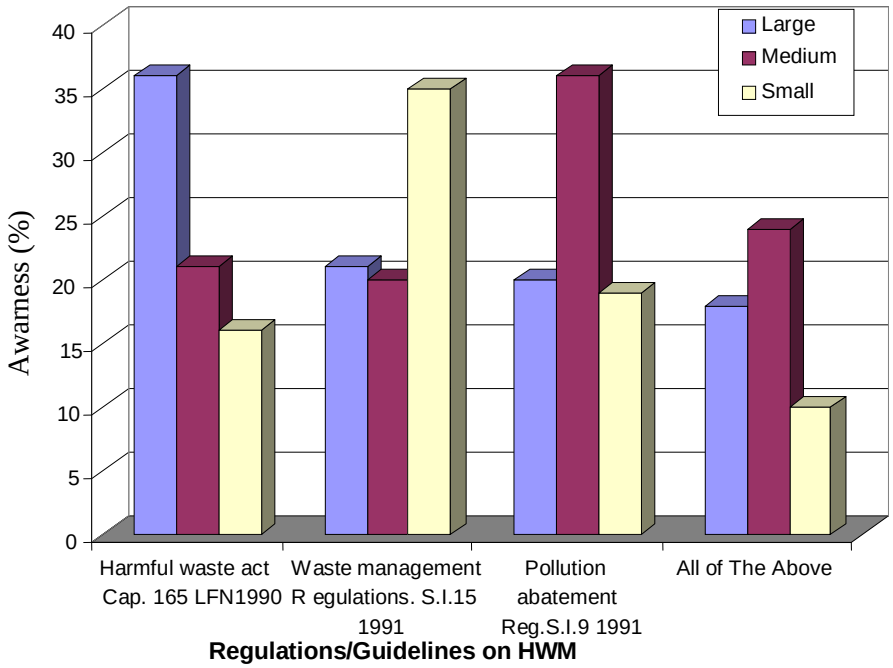


Figure 5. Relative awareness on existing guidelines/legislations on waste management and compliance by the different categories of hospitals.

by large, medium and small hospitals, it is not surprising to observe that the awareness is more in large hospitals than in the other category hospitals. It could be part of clients' requirement as a matter of policy especially for those hospitals doing business with oil and gas industries such as SPDC, Agip and Elf oil companies. These multi-nationals have an organized hospital waste management system that meets international standards. In addition, it may be that large hospitals have waste managers or an organized system of waste handling hence this level of awareness. It could be deduced that awareness on keeping record of wastes generated is a function of hospital category (LH>MH>SH). Secondly, it could also be as a result of the fact that health care facilities/ institutions have no enforceable legal or environmental obligation to keep record of wastes generated. No matter how it is viewed, this scenario has made it difficult not only to get a good approximation of waste generation data and more difficult to track hazardous wastes components in the waste generated in these hospitals.

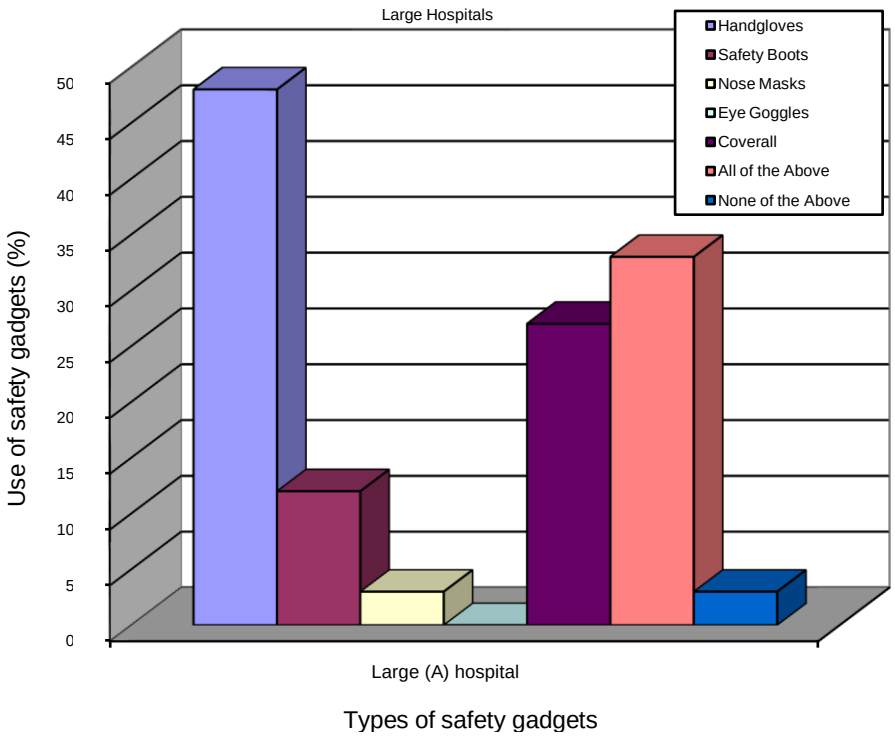


Figure 6a. Provision of safety gadgets to staff in waste handling by large hospitals.

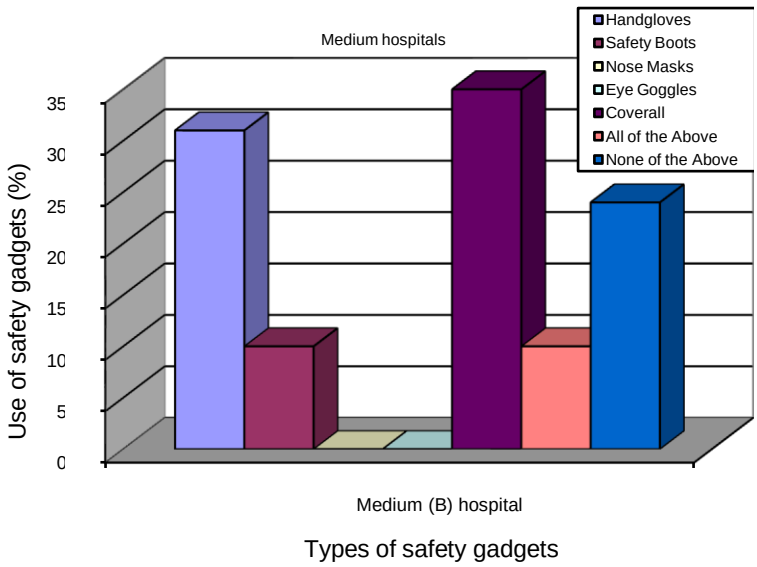


Figure 6b. Provision of safety gadgets to staff in waste handling by medium hospitals.

This assertion lends credence to the assertion of Coker and Sangodoyin (2000) that the management of health facilities is hampered by lack of basic waste generation data. Furthermore, it was observed that tracking of hazardous wastes in hospitals is often complicated by lack of available records on waste generation. It is therefore suggested that improved management oversight, tracking, and inventory control should be put in place to effectively reduce waste generation. Such data collected by this process can be used to produce a hospital waste bank on which further researches on hospital waste management could hinge upon.

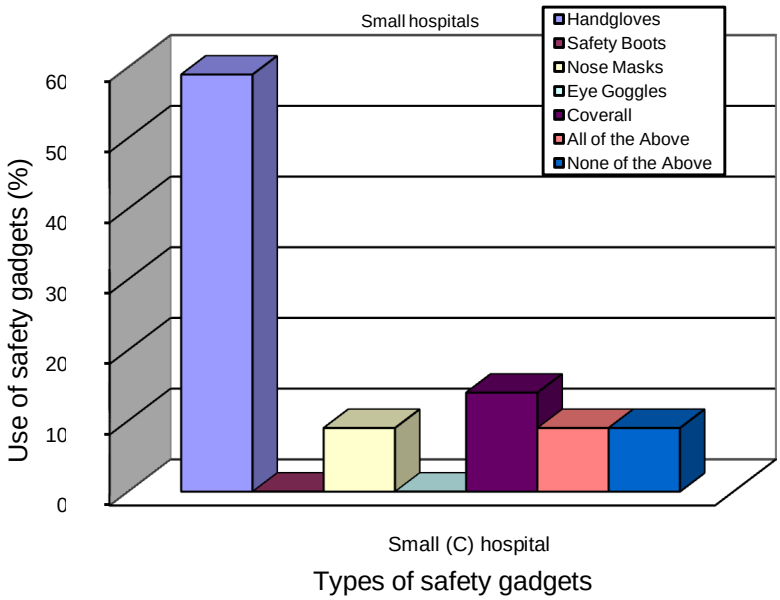


Figure 6c. Provision of safety gadgets to staff in waste handling by small hospitals.

The study on waste segregation showed that the three category hospitals are not aware of waste segregation as a management practice. It was revealed that wastes were hardly segregated into marked or colour-coded containers for the different waste streams as physical visits to various category hospitals confirmed a heterogeneous mixture of wastes in the same waste bin kept at a considerable distance from waste generation source. Non-separation of hospital wastes endangers scavengers and waste handlers in addition to the exposure of wild animals such as birds, flies and rodents that facilitate the spreading of germs from infectious medical wastes to nearby environments. This is confirmed by the findings of the study in Lagos by Olubukola (2009) that HCW management practices is marred by poor waste segregation practices as well as lack of instructive posters on waste segregation and disposal of general wastes. Segregation of wastes according to Ndidi et al. (2009) and Abah and Ohimain (2011) would result in a clean solid waste stream which could be easily, safely and cost effectively managed through recycling, composting and land filling. The nature and quantity of HCW generated in these hospitals makes it very imperative to employ waste segregation because of the health risks posed by the improper handling of HCW (Oke, 2008; Farzadika et al., 2009; Abah and Ohimain, 2011; Ogbonna, 2011). This is because the HCW contain materials that may be harmful and can cause ill health to those exposed to it; especially health workers who may be directly exposed and to people near health facilities, particularly children and scavengers who may become exposed to infectious wastes and a higher risk of diseases like hepatitis, HIV/AIDS (WHO, 1999; 2002; Oke, 2008; PATH, 2009; Coker, 2009; Adegbita et al., 2010). Further reports also indicate that several hundreds of tonnes of HCW are deposited openly in waste dumps alongside non-hazardous solid wastes around surrounding environments without segregation (Alagoz and Kocasay, 2007; Abah and Ohimain, 2010). This practice is characterized by lack of proper education on waste minimization or waste reduction strategies in healthcare institutions. Therefore good segregation practice will ensure a reduction in the quantity medical waste which is more expensive to manage. The absence of waste segregation according to Abah and Ohimain (2011) imply that the estimates of the various waste categories may not be precise; nonetheless it provides a useful guide for the assessment of the different waste streams generated by many of which are hazardous in nature requiring special handling to avoid health consequences.

This study observed inadequate, relevant training of waste handlers on disposal practices and provision of adequate equipment as a problem militating against proper waste management practice in healthcare institutions in Port Harcourt. If indeed they were being trained, the exercise did not impact on them skills and knowledge of the recommended measures for proper waste management process. In large hospitals, greater proportion of hospital wastes is known to be handled by trained personnel (55%), implying that it could be part of client requirement as a matter of policy especially for those large hospitals doing business with oil and gas industries in Port Harcourt. The fact that oil Companies require retainer clinics to meet up with their HSE standards could be responsible for this practice. In any case, the practice is not good enough which is an indication of the generally

poor attitude towards hospital waste management in Port Harcourt municipality. The implication of a large proportion of unawareness in medium and small hospital categories is predicated on the fact that these hospitals patronize the waste disposal outfits and therefore has no trained staff on waste management process. On the spot assessment of waste disposal agents in Port Harcourt showed that they treat the wastes they handle as normal domestic wastes and dispose them as such, thus confirming the findings of Fleming et al. (2002) that solid waste workers are exposed to significant levels of physical, chemical and biological toxins. This revelation was further strengthened by the results of the survey of garbage collectors regarding health and safety aspect of their jobs by Rogers et al. (2002), in which it was observed that 75% of the collectors were reported to have being injured in the process. The study also observed that waste disposal agents carry out partial sorting/scavenging during loading of wastes. The findings from the study also shows that training and retraining programmes should be organized for all workers (with no exceptions) in the hospitals, thereby creating awareness of wastes, its effects, importance of guidelines and the implementation of the waste management options for the different categories of waste.

This general perception is contrary to physical observations at some of the hospitals as there is little or no institutional arrangement for the management of hospitals medical wastes in all hospitals studied. This indicates that these hospitals have no specific policy to guide medical waste management. The available guidelines/legislations as corroborated by Coker and Sangodoyin (2000) are broad and focused more on solid wastes especially those covering toxic /industrial hazardous wastes. Thus these observations are in agreement with the observation of Louis (2001) that even though Nigeria has waste management regulations, the awareness level among waste generators regarding current or impending environmental legislation is unclear hence firms were not motivated to prevent or reduce waste by regulatory reasons. It is assumed that having been aware of the relevant legislations on wastes, hospitals' management should follow the appropriate procedure in disposal of these wastes. Contrary to this, the survey showed that health institutions treat their wastes as normal domestic wastes and dump them without appropriate handling procedure. Louis (2001) reported that environmental regulations in Nigeria do not play any important role in encouraging firms to improve their environmental performance or reduce waste. Despite the fact that there is no existing hospital waste policy to guide medical waste handling and disposal, in Nigeria (Coker and Sangodoyin, 2000; Louis, 2001), the individual hospitals do not have any guiding policy on hospital wastes generation, handling and disposal. This observation supports Melanen et al. (2001) and Townend and Cheeseman (2005) position that administrative instruments are still needed in order to control the use of harmful and dangerous substances and the management of hazardous wastes. Although awareness seems to have increased in the three hospitals as they claimed regarding the need for proper management and disposal of medical waste, it had no impact on the way hospitals handle wastes. One possible reason for this observation could be attributed to the general carefree attitude of Nigerians towards hospital waste management. Another argument could be hinged on the fact that environmental regulations in the country do not play any important role in encouraging hospitals improve their waste management; reason being lack of political will to enforce the existing regulations/guidelines on general waste management. This tend to agree with the report of Mato and Kaseava (1999) that many countries especially the developed nations have legal provisions with regard to proper management of hazardous wastes unlike developing countries where hazardous wastes are still handled and disposed together with normal domestic wastes thus posing a great health risks to municipal health workers, the public and the environment at large. For instance more than twenty (20) ordinances on waste have been issued in Finland since the National Waste Act came into force in 1994 and also as a requirement from European Union, Finland also has a National Waste management Plan (Melanen et al., 2001). This was not the case in Port Harcourt hospitals which showed that all the different categories of hospitals visited do not follow any procedural guideline in the management of harmful/dangerous/medical wastes as enshrined in the Federal Environmental Protection Agency Decree No 58 of 1988. To say the least decree No 58, of 1988 as amended by Harmful Wastes Act Cap 165 LFN 1990 and Waste Management Regulations S.I.15 1991 are defective as it did not encapsulate any broad policy framework that has direct influence on medical waste management neither did it take cognizance of the fact the scope of medical waste incineration processes should include monitoring of emissions and standards as it is done elsewhere (CDHS,1988; Mato and Kaseava, 1999; Melanen et al., 2001).

With regard to the provision of safety gadgets to staff in handling waste, the result showed that the three category hospitals provide safety gadgets to staff involved in waste handling. It was observed that the use of eye goggles as a safety gadget for waste handling seems not to be required by the various hospitals. It was also observed that Nose mask is not used in waste handling by medium hospitals. It was equally observed from oral interviews of personnel in the various hospitals as well as waste disposal agents' personnel that on the average, they were merely provided with protective wears such as coveralls, hand gloves and safety boots that do not ensure adequate protection. This observation confirms reports by other workers (Coker et al., 1998, 1999; Fleming et al., 2002; Rogers et al., 2002) that a high

proportion of waste handlers are highly exposed to the risks associated with medical waste handling. This also confirms Blackman (1993) reported that the health impact of direct and indirect exposure to hazardous wastes includes: Carcinogenic, mutagenic and tetratogenic effects, reproductive systems damage, respiratory effects etc. Fleming et al. (2002) revealed that injuries as well as acute and chronic musculo-skeletal, dermal, and respiratory health effects were well documented among solid waste workers. They lamented that this situation was particularly worsened by gross lack of protective wears in practically all the sampled health facilities. This was further supported by the observations of Mato and Kaseava (1999) that staff in charge of handling medical wastes, usually have no protective gear or sufficient knowledge of potential hazards of the wastes they handle.

Conclusion

Management of healthcare wastes has become one of the critical concerns in developing countries especially Nigeria. Healthcare waste is dangerous, if handled, treated or disposed off incorrectly can spread diseases, and poison people, livestock, wild animals, plants and ecosystems.

The study identifies inadequate relevant training of waste handlers on disposal practices and provision of adequate equipment as a problem militating against proper waste management practice in healthcare institutions in Port Harcourt. The hospitals do not segregate wastes neither do they keep records of waste generation and disposal. The study further revealed the absence of institutional arrangements for the management of hospital wastes at all levels. It is therefore recommended that staff training becomes imperative to create awareness on wastes, their effects, importance of existing guidelines and the implementation of the waste management options for the different categories of wastes so that hospitals do not become infections centres that contribute to the damage of both the environment and human health (Ndidi et al., 2009). To achieve this, healthcare institutions must utilize the most practical options to achieve acceptable standards and practices for HCW management using available technologies. The choice of waste treatment technology according to Abah and Ohimain (2011) should be tailored to urban or rural health facility. Waste segregation therefore, should be employed as a critical step to achieve waste minimization, cost reduction and sustainable waste management practice.

REFERENCES

Abah SO, Ohimain EI (2010). Assessment of Dumpsite Rehabilitation Potential using the Integrated Risk Based Approach: A case study of Eneka, Nigeria. World Appl. Sci J., 8(4): 436-442.

Abah SO, Ohimain EI (2011). Healthcare waste management in Nigeria: A case study. J Public Health Epidemiol., 3(3):99-110.

Adegbita MA, Nwafor SO, Afon A, Abegunde AA, Bamise CT (2010). Assessment of dental waste management in a Nigerian tertiary hospital. Waste Manage. Res., 28: 769-777.

Alagoz BAZ, Kocasoy G (2007). Treatment and disposal alternatives for healthcare wastes in developing countries-A case study in Isanbul, Turkey. Waste Manage. Res., 25: 83-89

Allsopp M, Costner P, Johnson P (2001). Incineration and human health. Uk: Greenpeace Research Laboratories, University of Exeter.

Blackman WL Jr. (1993). Basic Hazardous Management. Boca Raton, FL: Lewis.

CDHS (1988) California Department of Health Services.

Carl B, Janis B (1993). Improving municipal solid waste management in the Third World Countries: J. Resour. Conserv. Recycling 8: pp. 16-30.

Coker AO, Sangodoyin AY and Ogunlowo OO (1998). Managing hospital wastes in Nigeria; Proceedings of the 24th WEDC Conference, Islamabad, Pakistan, 31st August-4th September, Pp70-72.

Coker AO, Sikiru KA, Svidhar MKL, Sangodoyin AY (1999). Characterization and management of solid hospital wastes, Proceedings of the 25th WEDC conference, Addis Ababa, Ethiopia, pp. 331 – 334.

Coker AO, Sangodoyin AY (2000). Management of Urban Hospitals Wastes in Ibadan, Nigeria. Available at http://sunsite.wits.Ac.za/urbanfutures/papers/cokerhtmpit. Master Plan (1975).

Coker AO (2009). Medical waste management in Ibadan, Nigeria: Obstacles and Prospects. February 2009. Waste Manage. 29(2): 804-81

Da Silva CE, Hoppe AE,Ravanello MM, Melo N (2005). Medical waste management in the south of Brazil. Waste Manage., 25: 600-605

Echegaray M, Rodriguez, RA, Udaquiola SM,Hektor K (2002). Heavy metals in the ash fraction of medical waste incineration. *Ingenieria Quim*., 21: 12-17

Farzadika M, Moradi A, Mohammadi MS (2009).Hospital Waste management status in Iran: A case study in the teaching hospitals in Iran University of Medical Sciences. Waste Manage. Res., 27: 384-389

Ferreira AP, Veiga MM (2003). Hospital waste operational procedures: A case study in Brazil. Waste Manage. Res., 21: 377-382

Fleming LE, Danits M, Bean JA, Englehardt J, An J, John N, Rogers J (2002). Solid waste workers: Occupational exposures and health. The J. Solid Waste Technol. Manage. 28(2): 1-10

Kuroiwa C, Suzuki A, Yamaji Y, Miyoshi M (2004). Hidden reality on the introduction of auto-disable syringes in developing countries. Southeast Asian J. Trop. Public Health, 35: 10-23

Louis O (2001). An Assessment of Industrial Waste Minimization Practices in Nigeria. A case study of selected Industries in Lagos. Unpublished MBA Thesis, Federal University of Technology, Akure.

Mato RR, Kaseva ME (1999). Critical review of industrial medical waste practices in Dar es Salaam City: J. Res. Conserv. Recycling. 25: 271-287.

Melanen M, Kautto P, Saarikoski H, Ilomaki, M, Yli-Kauppila H (2001). Finish waste policy- effects and effectiveness. J. Res. Conserv. Recycling. 27: 1-15

Ndidi N, Ochekpe N, Odumosu P, John SA (2009). Waste management in healthcare establishments within Jos Metropolis, Nigeria. Afri. J. Environ. Sci. Technol., 3(12): 459-465

Ogbonna DN, Amangabara GT, Ekere TO (2007). Urban solid waste generation in Port Harcourt metropolis and its implications for waste management. Manage. Environ. Qual.: An Inter. J. 18(1): 71-88

Ogbonna DN (2011).Characteristics and waste management practices of medical wastes in healthcare institutions in Port Harcourt, Nigeria. J. Soil Sci. Environ. Manage. 2(5) :132-141

Oke IA (2008). Management of immunization solid wastes in Kano state, Nigeria. Waste Manage., 28: 2512-2521

Olubukola BO (2009). Comparative Analysis of Health Care Waste Management Practice in Two General Hospitals in Nigeria. Available at http://www.eco-web.com/edi/index.htm.

PATH (2009). Achieving effective sharps waste management in GAVI host countries, A proposed approach with estimates of cost 2006. Available at http://.www.Path.org/files/TS_ach_eff_swm.pdf. Accessed 27th July 2009.

Rhodes G, Huy G, Swings J, McGann P, Hiney M, Smith P, Pickup WR (2000). Distribution of oxytetracycline resistance plasmids between Aeromonads in hospital and aquaculture environments: Implications of Tn172 in dissemination of the tetracycline resistance determinant Tet A. Appl. Environ. Microbiol. 66(9): 3883-3890.

Rogers J, Englehardt J, An H, Fleming L (2002). Solid waste collection health and safety risks: Survey of municipal solid waste collectors. J. Solid Waste Technol. Manage. 28(3):13-26.

Townend WK, Cheeseman CR (2005). Guidelines for the evaluation and assessment of the sustainable use of resources and of wastes management at healthcare facilities. Waste Manage. Res., 23: 398-408.

Tudor TL, Noonan CL, Jenkin LET (2005). Healthcare waste management: A case study from the Comwall NHS, UK. Waste Manage., 25: 606-615.

Ubani NJ (2004). Assessment of hospital waste management in Port Harcourt metropolis. M. Phil Thesis, Environmental Management, Rivers State University of Science &Technology Port Harcourt, Nigeria.

United Nations Environment Program (UNEP)/SBC and World Health Organization (2005). Preparation of national healthcare waste management plans in subsaharan countries – Guidance Manual. WHO document production services, Geneva, Switzerland.

World Health Organization (1999). Unsafe injection practices and transmission of blood borne pathogens. Bull. World Health Org. 77: 787-819

World Health Organization (2002).Wastes from healthcare activities. Fact sheet no 231, April 2002, Available at http://www.who.int/mediacentre/factsheets/fs231/en. Accessed 12 September, 2009.

World Health Organization (2004). Safe Healthcare Waste Management, Policy paper, Fact sheet. Geneva. Available at http//www.who.int/entity/immunization_safety/publications/waste_management/en/HCWM_policy_paper_E.pdf Accessed12 September 2009.

Journal of Public Health and Epidemiology Vol. 4(6), pp. 170-177, June 2012
Available online at http://www.academicjournals.org/JPHE
DOI: 10.5897/JPHE12.018
ISSN 2141-2316 ©2012 Academic Journals

Full Length Research Paper

Seroprevalence of *Toxoplasma gondii* in pregnant women

Malarvizhi A.[1], Viswanathan T.[2], Lavanya V.[1], Arul Sheeba Malar S.[1] and Moorthy K.[1]*

[1]Department of Microbiology, Vivekanandha College of Arts and Sciences for Women, Elayampalayam, Tiruchengode, India.
[2]Department of Microbiology, Government Arts College (Men), Krishnagiri, India.

Accepted 4 May, 2012

The present work aimed to evaluate the seroprevalence of *Toxoplasma gondii* and their associated risk factors among the pregnant women. This study was carried out from 2009 to 2010 in 232 pregnant women attending the private hospitals in and around Salem, Tamil Nadu. Anti-toxoplasma specific IgG and IgM were assessed using Enzyme-linked immunosorbent assay (ELISA) test kits. Of these 232 samples, anti-toxoplasma specific immunoglobulin G (IgG) antibodies were detected in 23 (9.9%) cases while 9 (3.9%) had positive anti-toxoplasma specific immunoglobulin M (IgM) suggestive of acute infection during or just before pregnancy. A structured questionnaire interview for pregnant women was performed to investigate the risk factors associated with the *T. gondii* infection. The higher infection rate of 7.9% (for anti-toxoplasma IgG antibodies) was found with pregnant women living in rural area (15 subjects) than in urban area (8 subjects) and it was statistically significant (P<0.03). A few risk factors such as stillbirth (P<0.02), miscarriage (P<0.009), rearing cat as pet animal (P<0.005) and outdoor gardening (P<0.03) were statistically associated with the seroprevalence rate. Even with low seroprevalence rate of 9.9% latent infection and 3.9% acute infection there is a need for the pregnant women to be educated on the ways to minimize the exposure to *T. gondii* infection and to reduce the risk of congenital transmission.

Key words: *Toxoplasma gondii*, seroprevalence, pregnancy, anti-toxoplasma immunoglobulin G (IgG), immunoglobulin M (IgM).

INTRODUCTION

Toxoplasma gondii is a protozoan parasite widely distributed around the world (Liesenfeld and Janitschke., 2005; Hill et al., 2005) and it is the major opportunistic pathogen in immune-compromised hosts, which affects one third of the world population. Infection is mainly acquired by ingestion of food, water or soil contaminated with oocysts shed by the cat, or by eating under cooked meat containing oocysts and meat from animals infected with *T. gondii* (Dubey et al., 2005). Primary infection is usually subclinical, but in severely immune-compromised patients it may be life threatening (Montoya et al., 2004) and may even leads to some neurological damage like mental retardness, blindness and fetal death. The chances of fetal infection by *T. gondii* increase with the stage of pregnancy, from 5 to 15% in the first half to 60 to 80% in the second half of gestation. Conversely the chances of serious lesions and death decrease from 70 to 80% in the first half to less than 10% in the second half of gestation (Couto et al., 2003). Anti-parasitic treatment during pregnancy may reduce the risk of transmission to the fetus if it is identified early (Remington et al., 2001). Though the demonstration and isolation of *T. gondii* is confirmative it was found to be very difficult (Hung et al., 2007). Hence acute and latent infections are mostly diagnosed by serological tests including the detection of antibodies by Latex agglutination test, indirect fluorescent antibody test or the specific IgM and IgG-ELISAs (Montoya and Liesenfeld, 2004).

*Corresponding author. E-mail: moormicro@gmail.com.

Typically the organism causes only asymptomatic or mild infection in pregnant women but it can cause much more serious clinical complications to the fetus. Identification of these susceptible women is essential sothat early treatment can be offered to minimize the congenital transmission. Epidemiological studies indicate that prevalence of *T. gondii* infection in pregnant women varies substantially among countries. For instance in European countries, prevalence varies from 9 to 67% (Nash et al., 2005). In studies conducted in Sudan 34.1% and in New Zealand 33% anti-toxoplasma antibodies frequencies were found, respectively, (Elnahas et al., 2003; Morris and Croxson, 2004). A study performed at South Brazil in America, showed a higher prevalence, 74.5% and in Cuba it was 70.9% (Spalding et al., 2005; Gonzalez-Morales et al., 1995). In Asian countries, low prevalence values of *T. gondii* infection were found, that is 0.8% in Korea and 11.2% in Vietnam (Song et al., 2005; Buchy et al., 2003). In contrast, high prevalence was reported for Indian, Malaysian and Nepalese populations (Singh and Pandit, 2004; Akoijam et al., 2002; Nissapatorn et al., 2003; Rai et al., 1998). There was only little information available about the epidemiology of *T. gondii* infection in pregnant women living in South India, especially in the rural area of Tamil Nadu. Therefore the present study aimed to explore this and to analyze demographic factors, symptoms and risk factors associated to positive serology.

MATERIALS AND METHODS

In this study samples were collected from the private hospitals in and around Salem, Tamil Nadu. In this region many villages are there, most study subjects were farmers and could be taken as a model for the general population of Tamil Nadu with its socio-economic, cultural and ethnic diversity.

Study population

A descriptive cross-sectional study was conducted from 2009 to 2010. A total of 232 study subjects (pregnant women) participated in this study. They answered a structured questionnaire and signed an informed consent after they were advertised about symptoms and risks of toxoplasmosis infection. Pregnant women above 15 years of age were included. They were considered of low (normal pregnancy) or high risk (those having bad obstetric history, including repeated miscarriages, still-births and births of malformed products). Women undergoing an *in vitro* fertilization (IVF) were excluded from this study.

Ethical approval

Ethical approval for the study was obtained from the Institutional ethical committee, Vivekananda college of Pharmacy, Elayampalayam, Namakkal. (IEC/July/10/12).

Socio-demographic, clinical and behavioural data

Socio-demographic data including age, residential place, gravid status, educational level and gestation trimester were obtained from all study subjects, as well as clinical data including previous history of still-births and miscarriages, babies with eye infections or hydrocephalus; also, data about risk factors like pet cat owning, cleaning up cat excrement/sandbox, outdoor gardening, farm work and some associated symptoms like cough, headache and fever were also gathered.

Table 1. Prevalence of Toxo – IgM and Toxo – IgG.

Result	Prevalence of Toxo – IgM		Prevalence of Toxo – IgG	
	No.	%	No.	%
Positive	009	03.9	23	9.9
Negative	223	96.1	209	90.1
Total	232	100.0	232	100.0

Table 2. Prevalence of Toxo – IgM and IgG in different age groups.

Age	Total	Toxo – IgM Positive		Toxo - IgG Positive	
		No.	%	No.	%
Below 20	7	0	0.0	0	0.0
20 - 30	122	4	3.3	15	12.4
30 - 40	101	5	5.0	08	7.9
Above 40	002	0	0.0	0	0.0
Total	232	9	3.9	23	9.9

Serological detection

Sera or plasma obtained from the pregnant women were analyzed for anti-toxoplasma specific IgM and IgG antibodies by Euroimmun Kits (manufactured by Medizinische Labordiagnostika AG, Deutschland), following the instructions details in the products' insert.

Statistical analysis

Descriptive statistics of social-demographic variable and other characteristics of sampled population were computed. Percentage with 95% confidential interval (CI) was used to describe the prevalence. Odd ratio (OR) and 95% confidence interval (CI) was calculated for each association. A P-value less than 0.05 ($P< 0.05$) was calculated to be statistically significant. The statistical difference was also evaluated by applying the Chi-square test. All the Statistical analysis was done using the SPSS software package version 10 (SPSS Inc. Chicago, Illnois, USAT).

RESULTS

A total of 232 pregnant women were enrolled and screened for the presence of anti-toxoplasma IgM and IgG antibodies. The seroprevalence of *T. gondii* IgG and IgM antibodies are given in Table 1. The results revealed that 23 (9.9%) out of 232 pregnant women were positive for anti-Toxoplasma specific IgG and nine (3.9%) for IgM. All positive study subjects were in the 20 to 40 years age

group (Table 2). Various socio-demographic factors and their associated risk factors were statistically assessed and are shown in Table 3 and Table 4 separately for anti-toxoplasma IgM and IgG. Seven members from the nine anti-toxoplasma IgM pregnant women reside in rural areas and only two were from urban zones (Table 3). Similarly, from 23 positive anti-toxoplasma IgG subjects, eight belonged to urban areas, while the majority (n=15) were living in rural places (Table 4) (OR-0.38; C95%: 0.148-0.957; P<0.034). A higher seroprevalence was observed in first and second trimesters for both anti-toxoplasma IgM (9 subjects) and IgG antibodies (22 subjects) as compared to third trimester. Of 232 pregnant women enrolled, only 4 reported to have previous history of stillborns; 3 of them were positive for IgG and one for IgM antibodies (OR-9.17; C95%: P<0.027). One of the risk factor miscarriage was statistically associated with the positivity (eight IgM positive subjects and 12 IgG positive subjects - OR-3.05; 95% CI: 1.27-7.32 and P<0.0029.

The risk factors such as owning the cat, handling the cat litter, working in soil such as outdoor gardening and farm work were analyzed for the association with the toxoplasma infection. The cat was reared as pet animal by 35 women out of 232, among these 5 of them positive with anti-toxoplasma IgM and 8 subjects positively associated with anti-toxoplasma IgG and this variable was statistically significant (OR-3.60; 95% CI : 1.39-4.28 and P<0.005). But handling the cat litter does not show any association with the prevalence. Based on their occupational exposure most of the pregnant women were routinely work with the soil by doing the outdoor gardening (67 subjects) and went to farm work (113). Among the two variables analyzed, outdoor gardening was found to have significant association with the presence of anti-toxo IgG antibodies (OR – 2.50; 95% CI: 1.04 to 5.99 and P<0.034). The symptoms of the toxoplasmosis were analyzed, such as fever, cough and headache were positively associated and the symptom of cough alone is statistically significant with anti-toxoplasma IgG antibodies (OR – 8.05; (95% CI: 1.06 to 1.14 and P<0.017) and other signs were not significant for both IgG and IgM. The relevant signs and symptoms for congenital toxoplasmosis were the baby with eye infection and Hydrocephalus. Of the 232 women studied, 19 members reported that their babies suffered from eye infection and of these 3 were found tested to be recent infection and 16 had a latent infection. The specific symptom of the congenital toxoplasmosis was Hydrocephalus. Only 4 out of the 232 pregnant women delivered their previous baby with hydrocephalus and 3 of them were positive for IgG antibodies and 2 were positive with IgM antibodies.

DISCUSSION

Toxoplasmosis infection caused by the parasite *T. gondii* leads to many serious health complications. It has been estimated that one third of the world population is infected by *T. gondii* (Montoya and Liesenfeld, 2004). Primary infection may be mild and asymptomatic, but when transmitted transplacentally, can cause congenital toxoplasmosis. Congenital toxoplasmosis leads to wide range of manifestations including mild chorioretinitis to mental retardation, microcephaly, hydrocephalus and seizures. It can also cause some repeated abortions, still birth and fetal loss in infected pregnant women. During pregnancy the clinical implications of these infections are tremendously dangerous which necessitates the importance of evaluating the immunological status of the pregnant women regarding toxoplasmosis.

Traditionally, screening for toxoplasmosis has been carried out in France (Jeannel et al., 1988) and Austria (Aspock and Pollak, 1992) as a mandatory part of the prenatal care. Prenatal screening have also been carried out as pilot projects in Finland (Lappalainen et al., 1992), Norway (Stray-Pedersen and Lorentzen-Styr, 1979), some parts of Sweden (Anlfors et al., 1989) and Germany (Krausse et al., 1993) but it is not mandatory in Italy (Valeria and Francesca, 2010). Women should be encouraged to perform tests for Toxoplasmosis before and during pregnancy. This screening should be based on the detection of specific IgG and IgM antibodies for the differentiation of recent and latent infections and the positive women should be referred to the reference laboratory for further confirmation and follow up studies.In North India seroprevalence of toxoplasmosis were reported to vary from 5 to 46.7% (Dhumne et al., 2007; Akojam et al., 2002; Yasodhara et al., 2001). In the present study seroprevalence of anti-IgG and IgM antibodies in pregnant women are 9.9 and 3.9% respectively, which is lower than rates previously reported from other regions of India (Mohan et al., 2002; Singh and Pandit, 2004; Singh et al., 1994). A slightly higher prevalence of 15.33% was reported Khurana et al. (2010) in Chandigarh. In a study conducted by Munoz *et al.,* (2004) the prevalence of toxoplasmosis was low (28.6%) but acute toxoplasmosis was detected mainly by sero-conversion during pregnancy. Nine women out of 12 with an acute toxoplasma infection became sero-converted during their pregnancies and five of them had infants with congenital toxoplasmosis (vertical transmission: 41.6%). All four children born alive had no symptoms during their follow-up. The frequency of maternal-fetal transmission was near half of cases. This study states the importance of detection of toxoplasmosis. The prevalence report of a Democratic Republic of Sao Tome and Principe is very high of 75.2% (Chia-Kwung Fan et al., 2007). Similarly 75.4% in Nigeria (Onadeko et al., 1996), 60% in Yopougon (Adou-Bryn et al., 2004), 58.4% in Tunisia (Bouratbine et al., 2001) and 34.1% from pregnant women in Sudan (Elnahas et al., 2003). As stated by Montoya and Liesenfeld, (2004) the reasons for the low prevalence may be due to the dry climate and high temperature which reduces the infectivity of the *T. gondii*

Table 3. Association of IgM anti-*Toxoplasma* antibodies and different variables.

Variables	Total (n)	Positive	Odds ratio	*P* value
Age				
<20	7	0		
20-30	121	4	-	
30-40	101	5		0.935
>40	2	0		
Rural /urban				
Rural	189	7	0.79	0.771
Urban	43	2		
Literacy				
Illiterate	102	4		
School level	78	3	1.02	0.999
Graduate	52	2		
No. of children				
None	138	5		
One	86	3	-	0.437
More than one	8	1		
Trimester				
T- I	93	4		
T- II	117	5	1.000	0.627
T- III	22	0		
Experience of miscarriage				
Yes	67	8	22.24	5.08
No	165	1		
Experience of still birth				
Yes	4	1	9.17	0.027**
No	228	8		
Pet animal as cat				
Yes	35	5	8.04	0.000***
No	197	4		
Handling of cat litre				
Yes	6	2	15.64	0.000***
No	226	7		
Outdoor gardening				
Yes	67	5	3.25	0.071
No	165	4		
Farmwork				
Yes	113	6	2.17	0.271
No	119	3		
Fever				
Yes	184	8	2.14	0.469
No	48	1		
Cough				
Yes	175	9	-	0.080
No	57	0		
Headache				
Yes	176	8	2.62	0.351
No	56	1		
Previous baby with eye infection				
Yes	19	3	6.47	0.005***
No	213	6		
Baby with Hydrocephalus				

Table 3. contd.

Yes	4	2	31.57	1.45
No	228	7		

Table 4. Association of IgG anti-*Toxoplasma* antibodies and different variables.

Variables	Total(n)	Positive	Odds ratio	*P* value
Age				
<20	7	0		
20 to 30	121	15	0.00	0.665
30 to 40	101	8		
>40	2	0		
Rural /urban				
Rural	189	15	0.38	0.034**
Urban	43	8		
Literacy				
Illiterate	102	12		
School level	78	7	-	0.685
Graduate	52	4		
No. of children				
None	138	13		
One	86	9	0.89	0.938
More than one	8	1		
Trimester				
T- I	93	14		
T- II	117	8	-	0.095
T- III	22	1		
Experience of miscarriage				
Yes	67	12	3.05	0.009***
No	165	11		
Experience of still birth				
Yes	4	3	31.20	1.11
No	228	20		
Pet animal as cat				
Yes	35	8	3.60	0.005***
No	197	15		
Handling of cat liter				
Yes	6	3	10.30	0.00***
No	226	20		
Outdoor gardening				
Yes	67	11	2.50	0.034**
No	165	12		
Farmwork				
Yes	113	11	0.96	0.929
No	119	12		
Fever				
Yes	184	20	1.83	0.34
No	48	3		
Cough				
Yes	175	22	8.05	0.017**
No	57	1		

Table 4. contd.

Headache				
Yes	176	18	1.16	0.776
No	56	5		
Previous baby with eye infection				
Yes	19	9	12.79	1.19
No	213	14		
Baby with hydrocephalus				
Yes	4	3	31.20	1.11
No	228	20		

*** Significant at 1% level, ** Significant at 5% level.

oocysts. Controversially a very low prevalence was reported from a state in Southern Brazil (0.1%) (Marah et al., 2006) and 0.6 to 0.85% in other regions of the same country (Mozzato and Soibelmann-Procianoy, 2003; Segundo et al., 2004). In the present study seropositivity was observed more in the age group of 20 to 40 years, where as it was lower for those below 20 years and above 40 years which is similar to those found with the study of Hung et al. (2007). But in few studies it was found that prevalence increases as the age increases, the reason might be increasing risk of exposure with age (Hill and Dubey, 2002; Morris and Croxson, 2004; Peterson et al., 2000).

In this study most of the pregnant women belonging to the first and second trimester showed the higher seropositivity than in the third trimester. Those women infected during the first trimester could be very harmful to the fetus because after maternal acquisition of *T. gondii* for the first time during gestation the parasite will enter the fetal circulation by the infection through the placenta. This may result in severe congenital toxoplasmosis and can result in death of the fetus *in vitro* and can also result in spontaneous abortion (Montoya and Liesenfeld, 2004). In the prevalence of Toxo-IgG (7 among 9) and IgM (15 among 23) were found to be higher in rural area than in urban people and statistical significance was found with toxo-IgG positivity (OR-0.38; 95% CI: 0.14 to 0.95 and P<0.034), but controversially no statistical significance was observed between urban and rural areas (Baril et al., 1999) and in a study with (Ades et al., 1993) higher seroprevalence was found in urban areas. The present study showed that the rate of seropositivity of *T. gondii* among women who had cats as pet animal was significantly higher (22.9%) than those without any cat in their house (7.6%). This finding is in accordance with those reported by other workers (AI-Omar et al., 1993; Muna and Nadham, 1997).The risk of developing toxoplasmosis among those who had cats was three times greater than those not living with cats and a statistical significance was found with the present study (OR-3.60; 95% CI: 1.39 to 4.28 and P<0.005) for positivity owning cat.

The lack of an association with cat was also previous in a study conducted by Kapperud et al. (1996). This is because cats excrete oocysts for 2 weeks during infection and within 5 days they become infective and can survive for more than a year. Hence through soil, surface water and cat the infection may survive; therefore it is advised to thoroughly wash all fruits and vegetables before consumption. In the current analysis, a statistical significance was observed with the seropositivity of women working in outdoor garden (OR-2.50; 95% CI: 1.04 to 5.99 and P<0.034). This may be due to that neighbourhood or feral cats that defecate in garden or sand boxes which may pose the greatest risk for *T. gondii* infection in some people regardless of whether they own a cat. In congenital toxoplasmosis, miscarriage and still birth are controversial subjects. But a study in India reports high pregnancy wastage in those positive for IgG (Mookherjee et al., 1995) while in another study 34.5% of women with recurrent pregnancy wastage tested positive toxoplasma specific IgM (Zargar et al., 1999) and it was similar to the present study (12 subjects-17.9%) with a significant association of miscarriage (OR-3.05; 95% CI: 1.27 to 7.32 and P<0.009) and also with still birth 1 subject (25%) was positive for anti-toxoplasma IgM (OR-9.17; 95% CI: 0.85 to 98.11 and P<0.027). Some reports have suggested that pregnant women diagnosed with the acute toxoplasmosis should be treated as soon as possible to reduce the risk and severity of congenital infection (Foulon et al., 1999; Gilbert et al., 2001; Gras et al., 2005). Others have argued that there is still no treatment capable of reducing vertical transmission. Neverthless, a recent meta-analysis reported that a maternal treatment started within three weeks of sero-conversion had a small effect in the reduction of vertical transmission when compared to the treatment that were started eight or more weeks after sero-conversion (Thiebaut et al., 2007).

These results pointed out the need for antenatal screening before pregnancy and treatment for those infected mother. There must be an educational programme for the general public as they are given to the pregnant women, because the health information and

health protection strategies should be relevant to the general people also. Based on the results of the present study, it is recommended and requested for the government to educate the people about the source, transmission and preventive measures of toxoplasmosis. The knowledge regarding the risk factors should first be given to the health care workers, pregnant women and women at child bearing age. All these data emphasize the need for developing a general screening programme for toxoplasmosis in India.

ACKNOWLEDGEMENTS

We are grateful to the Dr. M. Karunanithi, Chairman and secretary, Vivekananda Educational Institutions and the authorities of Private Hospitals in and around Namakkal for their support and technical assistance.

REFERENCES

Ades AE, Parker S, Gilbert R, Tookey PA, Berry T, Hjelm M, Wilcox Ah, Cubitt D, Peckham CS (1993). Maternal prevalence of toxoplasma antibody based on anonymous neonatal serosurvey: A geographical analysis. Epidemiol. Infect., 110(1): 127-133.

Adou-Bryn KD, Ouhon J, Nemer J, Yapo CG, Assoumou A (2004). Serological survey of acquired toxoplasmosis in women of child bearing age in Yopougon. Bull. Soc. Pathol. Exot., 97: 345-348.

Akoijam BS, Shashikant, Singh S, Kapoor SK (2002). Seroprevalence of toxoplasma infection among primigravid women attending antenatal clinic at a secondary level hospital in North India. J. Indian Med. Assoc., 100: 591-592.

Al-omar OM, Tabbara KF (1993). Prevalence of toxoplasma antibodies among Saudi eye patients. Saudi Med. J., 14(3): 244-246.

Anlfors k, Borjeson M, Huldt G, Forsberg E (1989). Incidence of toxoplasmosis in pregnant women in the city of Malmo, Sweden. Scand. J. Infect. Dis., 21: 315-321.

Aspock H, Pollak A (1992). Prevention of prenatal toxoplasmosis by serological screening of pregnant women in Austria. Scand. J. Infect. Dis. Suppl., 84: 32-38.

Baril L, Ancille T, Goulet V, Thulliez P, Tired-Fleury V, Carme B (1999). Risk factors for toxoplasma infection in pregnancy: a cross sectional study in France. Scand. J. Infect. Dis., 31: 305-309.

Bouratbine A, Siala E, Chahed MK, Aoun K, Ben Ismail R (2001). Seroepidemiologic profile of toxoplasmosis in Northen Tunisia. Parasite, 8: 61-66.

Buchy P, Follezou JY, Lien TX, An TT, Tram LT, Tri DV, Cuong NM, Glaziou P, Chien BT (2003). Serological study of toxoplasmosis in a population of drug users (Ho Chi Minh City) and pregnant women (Nha Trang). Bull. Soc. Pathol. Exot., 96: 46-47.

Hung C-C, Fan C-K, Su K-E, Sung F-C, Chiou A-Y, Gil V, Da M Ferreira CD, Ole Carvalho JM, Cruz C, Lin Y-K, Tseng L-F, Sao K-Y, Wen-Cheun Chang HSL, Shing-Hsien C (2007). Serological screening and toxoplasmosis exposure factors among pregnant women in the Democratis Republic of Sao Tome and Principe. Trans. Royal Society Tropical Med. Hygiene, 101: 134-139.

Couto JCF, Melo RF, Rodrigues MV, Leite JM (2003). Diagnostico pre-natal e tratamento da toxoplasmose na gestacao. Femina. 31: 85-90.

Dhumne M, Sengupta C, Kadival G, Rathinaswamy A, Velumani A (2007). National Seroprevalence of *Toxoplasma gondii* in India. J Parasitol., 93: 1520-1521.

Dubey JP, Hill S (2005). Toxoplasmosis. In. The Merck Veterinary Manual. Kahn CM (Eds). Merck and Co., New Jercy, p. 549.

Elnahas A, Gerais AS, Eibashir MI, Eldien ES, Adam I (2003). Toxoplasmosis in pregnant Sudanese women. Saudi Med. J., 24: 868-870.

Foulon W, Villena I, Stry-Pedersen B, Dewster A, Lappalainen M, Pinon JM, Jenum PA, Hedman K, Naessens A (1999). Treatment of toxoplasmosis during pregnancy: A multicenter study of impact on fetal transmission and children's squeal at age 1 year. Am. J. Obstet. Gynecol., 180: 410-415.

Gilbert R, Dunn D, Wallon M, Hayde M, Prusa A, Lebech M, Kortbeek T, Peyron F, Pollak A, Petersen E (2001). Ecological comparison of the risks of mother-to-child transmission and clinical manifestations to congenital toxoplasmosis according to prenatal treatment protocol. Epidemiol. Infect., 127: 113-120.

Gonzalez-Morales T, Bacallo-Gallestey J, Garcia-Santana CA, Molina-Garcia JR (1995). Prevalence of *Toxoplasma gondii* in apopulation of pregnant in Cuba. Gac. Med. Mex., 131: 499-503.

Gras L, Wallon M, Pollak A, Cortina-Borja M, Evengord B, Hayde M, Petersen E, Gilbert R (2005). Association between prenatal treatment and clinical manifestations of congenital toxoplasmosis in infancy: A cohort study in 13 European Centers. Acta. Paediatr., 94: 1721-1731.

Hill D, Dubey JP (2002). *Toxoplasma gondii*; transmission, diagnosis and prevention. Clin. Microbiol. Infect., 8: 634-640.

Hill DE, Chirukandoth S, Dubey JP (2005). Biology and epidemiology of *Toxoplasma gondii* in man and animals, 6: 41-61.

Jeannel D, Neil G, Costaglida D, Danis M, Traore BM, Gentillini M (1988). Epidemiology of toxoplasmosis among pregnant women in the Paris area. Int. J. Epidemiol., 17: 595-602.

Kapperud G, Jenum PA, Stray-Pedersen B, Melby KK, Eskild A, Eng J (1996). Risk factors for *Toxoplasma gondii* infection in pregnancy, results of a prospective case-control study in Norway. Am. J. Epidemiol., 144: 405-412.

Khurana S, Bagga R, Agarwal A, Lyngdoh V, Shivvapriya, Diddi K, Malla V (2010). Serological screening for antenatal toxoplasma infection in India. Indian J. Med. Microbiol., 28(2): 143-146.

Krausse T, Strube W, Wiersbitzky S, Hitz V, Kewitsch A (1993). Toxoplasma screening in der schangerschaft- ein pilot program in Nordosten Deutschlands. Geburtsshilfe Frauen heilkd, 53: 613-618.

Lappalainen M, Koskela P, Hedman K (1992). Incidence of primary toxoplasma infection during pregnancy in Southern Finland: a prospective cohort study. Scand. J. Infect. Dis., 24: 97-104.

Liesenfeld O, Janitschke K (2005). Toxoplasma.In Medizinische Mikrobiologie und Infektiologie. Auflage 5. Edited by Hahn H, Falke D, Kaufmann SHE, Ullmann U.Sringer Medizin-Verlag. Berlin, pp. 750-753.

Montoya JG, Liesenfeld O (2004). Toxoplasmosis. Lancet, 363: 1965-1976.

Mookherjee N, Gogate A, Shah PK (1995). Microbiological evaluation of women with bad obstetric history. Indian J. Med. Res., 101: 103-107.

Morris A, Croxson M (2004). Serological evidence of *Toxoplasma gondii* infection among pregnant women Auckland. N. Z. Med. J., 117: U770.

Mozzato L, Soibelmann-Procianoy R (2003). Incidencia da toxoplasmose congenital no sul so Brasil: estudo prospective. Rev. Inst. Med. Trop. Sao. Paulo, 45: 147-151.

Muna MA, Nadham KM (1997). Toxoplasmosis among women with habitual abortion. Eastern Mediterranean Health J., 3(2): 310-315.

Munoz Batet C, Guardia Llobet C, Juncosa Morros T, Vinas Domenech L, Sierra Soler M, Sanfeliu Sala I, Bosch Mestres J, Dopico Ponte E, Lite Lite J, Matas Andreu L, Juste Sanchez C, Barranco Romeu M (2004). Toxoplasmosis and pregnanacy. Multicenter study of 16,362 pregnant women in Barcelona. Med. clin. 123 : 12-16.

Nash JQ, Chissel S, Jones J, Warburton F, Verlander NQ (2005). Risk factors for Toxoplasmosis in pregnant women in Kent, United Kingdom. Epidemiol. Infect., 133: 475-483.

Nissapatorn V, Noor Azmi MA, Cho SM, Fong MY, Init I, Rohela M, Khairul Anuar A, Quek KF, Latt HM (2003). Toxoplasmosis: prevalence and risk factors. J. Obstet. Gnaaecol., 23: 618-624

Onadeko MO, Joyson DH, Payne RA, Francis J (1996). The prevalence of toxoplasma antibodies in pregnant Nigerian women and the occurrence of stillbirth and congenital malformations. Afr. J. Med. Sci., 25: 331-334.

Peterson K, Stray-Pederson B, Forsgren M, Evengard B (2000). Seroprevalence of *Toxoplasma gondii* among pregnant women in Sweden. Acta Obstet. Gynecol. Scand., 79: 824-829.

Rai SK, Shibata H, Sumi K, Rai G, Rai N, Manandhar R, Gurung G, Onto K, Uga S, Matsuoka A, Shrestha HG, Matsumura T (1998). Toxoplasma antibody prevalence in Napalese pregnant women and women with bad obstetric history. Southeast Asian J. Trop. Med. Public Health, 29: 739-743.

Remington JS, McLeod R, Thulliez P, Desmonts G (2001). Toxoplasmosis.In: Remington JS, Klein JO, editors. Infectious diseases in the fetus and newborn infant. 5th ed. Philadelphia : W.B Saunders Company, pp. 205-346.

Segundo GRS, Silva DAO, Mineo JR, Ferreira MS (2004). Acoparative study of congenital toxoplasmosis between public and private hospitals from Uberlandia MG, Brazil. Mem. Inst. Oswaldo. Cruz., 99: 13-17.

Singh S, Pandit AJ (2004). Incidence and prevalence of Toxoplasmosis in Indian pregnant women: a prospective study. Am. J. Reprod. Immunol., 52 : 276-283.

Singh S, Singh N, Pandav R, Pandav CS, Karmarkar MG (1994). *Toxoplasma gondii* infection and its association with iodine deficiency in a residencial school in a tribal area of Maharashtra. Indian J. Med. Res., 99: 27-31.

Song KJ, Shine JC, Shine HJ, Nam HW (2005). Seroprevalence of toxoplasmosis in Korean pregnant women. Korean J. Parasitol., 43: 69-71.

Spalding SM, Amendoira MR, Klein CH, Ribeeiro LC (2005). Serological screening and toxoplasmosis exposure factors among pregnant women in South Brazil. Rev. Soc. Bras. Med. Trop., 38: 173-177.

Stray-Pedersen B, Lorentzen-Styr AM (1979). The prevalence of toxoplasma antibodies among 11736 pregnant women in Norway. Scand. J. Infect. Dis., 128: 716-721.

Thiebaut R, Leproust, Chene G, Gilbert R (2007). Effectiveness of prenatal treatment for congenital toxoplasmosis: a meta-analysis of individual patient's data. Lancet, 369: 115-122.

Valeria M, Francesca G (2010). Screening for toxoplasmosis during pregnancy: One year experience in an Italian reference laboratory. Scientia Medixa (Porto Alegre), 20: 35-39.

Yasodhara P, Ramalakshmi BA, Naidu AN, Raman L (2001). Prevalence of specific IgM due to Toxoplasma, Rubella, CMV and *C. trachomatis* infections during ppregnancy. Indian J. Med. Microbiol., 19: 52-56.

Zargar AH, Waani SR, Laway BA, Kakroo DP, Sofi BA (1999). Seroprevalence of toxoplasmosis in women with recurrent abortions/ neonatal deaths and its treatment outcome. Indian J. Pathol. Microbiol., 42(4): 483-486.

Journal of Public Health and Epidemiology Vol. 4(6), pp. 178-183, June 2012
Available online at http://www.academicjournals.org/JPHE
DOI: 10.5897/JPHE11.203
ISSN 2141-2316 ©2012 Academic Journals

Full Length Research Paper

Sero-prevalence study of Hepatitis C virus infection among blood donors attending selected blood banks in some Local Government Areas in Kano, Nigeria

A. H. Kawo[1]*, J. A. Bala[2] and Y. U. Dabai[3]

[1]Microbiology Unit, Department of Biological Sciences, Bayero University, P. M. B. 3011, Kano, Nigeria.
[2]Department of Pathology, Murtala Mohammed Specialist Hospital, Kano, Nigeria.
[3]Department of Public Health and Preventive Medicine, Usmanu Danfodiyo University, P. M. B. 2346, Sokoto, Nigeria.

Accepted 23 March, 2012

Hepatitis C virus (HCV) infection afflicts more than 170 million people worldwide, with the great majority of patients having acute hepatitis C later developing into chronic HCV infection. 320 participants (80 in each of four blood banks from Wudil, Gaya, Sumaila and Takai Local Government Areas (LGA)) were tested for antibodies to HCV. Out of a total of the 320 subjects, 319 were males and 1 female between the ages of 14 to 54 years. Third-generation enzyme–linked immunosorbent assay was used in the analysis. 16 out of the 320 were reactive, representing 5.0% of the total population studied. This showed a high prevalence of HCV infection among blood donors in this part of the country when compared with those established for western countries. Prevalence rate based on the 80 subjects in each LGA indicated Gaya and Wudil to have highest prevalence of 5(6.3%) each, followed by Sumaila with 4(5.0%). Takai was observed to have the least prevalence rate of 2(2.5%). The relationship between the demographic data with HCV infection revealed no statistical significance (P > 0.05). However, the relationship between possible risk factors and HCV infection revealed significant statistical association in the transmission through family (vertical transmission), receipt of injection as well as consumption of alcohol. Other possible risk factors such as blood transfusion did not reveal statistical association even though there were differences in positivity across the risk factors.

Key words: Seroprevalence, Hepatitis C virus, Blood Banks, Kano.

INTRODUCTION

Hepatitis C virus (HCV) infection afflicts more than 170 million people worldwide, with the great majority of patients with acute hepatitis C developing chronic HCV infection. It can ultimately result in liver cirrhosis, hepatic failure or hepato-cellular carcinoma, which is responsible for hundreds of thousands of deaths each year. Hepatitis C virus is a positive stranded RNA virus classified as a separate genus *Hepacivirus* in the family Flaviviridae (Jawetz and Adelberg, 2007). The HCV appears to have a narrow host range (Rogo, 2011). Human and chimpanzees are the only known species susceptible to infection, with both species developing similar disease. According to Lansing and Donald, (2000), the structure and replication of HCV are incompletely understood due to low viral titers found in sera and livers of individuals infected and lack of an efficient cell culture system or small animal model permission for HCV infection. But with heterologous expression systems, functional CDNA (complementary DNA) clones, and most recently, selectable sub genomic replicons have been made (Choo et al., 1989; Rogo, 2011). Several different genotypes of HCV with slightly different genomic sequences have since been identified that correlate with differences in response to treatment with interferon (Howard, 2002; Rogo, 2011). Within an infected individual, HCV consists

*Corresponding author.E-mail: ahkawo@yahoo.com. Tel: +234-802-3153895.

of a population of closely-related but heterogeneous sequences, called quasispecies that result from rapid development of mutations in critical region of the envelope protein (Farci, 1991). The HCV has long incubation period of 2 to 26 weeks (Chukwurah et al., 2005). The virus is plasma-borne and has the same routes of transmission in common with hepatitis B virus-sexual contact, exposure to contaminated blood and blood products, or vertical transmission that is from mother to her fetus during the prenatal period. HCV infection is usually silent and acute phase is asympto-matic, progressing to chronic cirrhosis and hepatocellular carcinoma. Hepatitis due to HCV is quite similar to hepatitis due to other agents but the disease is commonly without jaundice and often clinically mild (Jawetz and Adelberg, 2007). Primarily, liver cells damage coincides with the development of the host immune response and not with infection and viral replication. In addition, persistent viral replication often occurs without evidence of liver damage, suggesting that HCV is not directly cytopathic (Darius et al., 2001). The symptoms includes decreased appetite, fatigue, abdominal pain, occasional jaundice, itching, malaise, raised serum transferase level, muscle pain, joint pain, sleep disturbance, diarrhea, depression, headache and flu–like symptoms (Cox et al., 2005; Sheyin et al., 2011). Virtually all persons infected with HCV show evidence of inflammation on liver biopsy, however the rate of progression of liver scarring (fibrosis) shows significant variability among individuals. The progression of the disease has been found to be influenced by some factors such as age, gender (males have more rapid disease progression than females), alcohol consumption, HIV co-infection, Hepatitis B vaccine (HBV) co-infection, serum aminotransferase level, viral load, genotype and fatty liver (Ejiofor et al., 2010). Studies have shown that with the introduction of routine screening for Hepatitis B surface antigen (Hbs-Ag) in the serum of blood donors has reduced the incidence of post-transfusion hepatitis B infection (Okafor and Obi, 1979). Apart from hepatitis B, HCV may be seen as cause of complications of blood transfusion. Hence, this research was carried out to determine the sero-prevalence of hepatitis C virus infection among the blood donors in Southern part of Kano State, Nigeria.

MATERIALS AND METHODS

Study area/population

Blood samples were collected from four blood banks in the general hospitals of Wudil, Gaya, Sumaila and Community/NYSC Comprehensive Health Centre, Takai. Consenting blood donors were recruited for the study when they came to laboratories for blood donation.

Sample collection and handling

A total of 320 volunteers who consented and completed questionnaire were sampled. The collection was achieved first by applying a tourniquet, which was tied on the upper arm of the donor, the antecubital region was disinfected with 70% alcohol. 3 ml of whole blood was withdrawn aseptically from the cephalic vein of the antecubital fossa of each donor using a sterile syringe. The tourniquet was then removed and the puncture blocked with sterile dry cotton wool and moderate pressure was applied to stop bleeding. The blood was transferred to plain container and allowed to clot for separation (Chesebrough, 2005).

Separation and storage of serum

The clotted blood was spun at 3000 rpm for 10 min, the serum separated into a sterile plain container(s) and stored at -20°C before use. The analysis was carried out using third-generation enzyme-linked immunosorbent assay (ELISA) (manufactured by Clinotech Diagnostics and Pharmaceutical Inc, Canada).

Test procedure

The test kit with the reagents and specimens were allowed to equilibrate to room temperature before the assay was carried out. The micro-titre plates coated with HCV were removed from the sealed bags and used immediately. One hundred microliter of specimen diluent was pipetted into each test well (5 wells were left for controls and blank). One hundred microliters of positive and negative controls was pipetted to duplicate wells while 100 microliters of distilled water was pipetted into the blank well. Five microliters of each sample was added into the assignment well, it was vortex to mix and incubated at 37°C for 30 min. Each well was washed 5 times by filling each well with diluted wash buffer (1:25), then inverting the plate vigorously to get all water out and blocked rim of wells on absorbent paper for a few seconds. One hundred microliter of enzyme conjugate was added to each well except blank well and was mixed gently by swirling the micro-titer plate and then incubated at 37°C again for 30 min. It was washed five times. One hundred microliters of 3,5-tetramethyl benzadine (TMB) solution (Horse Raddish peroxidase, substrate) was added to each well, and then incubated at 37°C for 10 min. Fifty microliters of stop solution was added to each well, which stops the color reaction. The optical density (OD) was read at 450nm with a multiscan system (EIA reader).

Interpretation of results

All absorbance values, for both the controls and the specimens were subtracted by the value of the blank before interpretation. The presence or absence of antibody specific for HCV was determined by relating the absorbance of the specimens to cut-off value.

Calculation of cut-off value:

Cut – off value = P × 10% + N: In this study; P = 1.865, N = 0.045

$$\text{Cut} - \text{off} = 1.865 \times 10\% + 0.045$$
$$= 1.865 \times 0.1 + 0.045$$
$$= 0.1865 + 0.045$$
$$= 0.2315 \approx 0.232.$$

A test is positive if S ≥ cut-off value. A test is negative if S < cut-off value.

Where, N = Mean absorbance of the negative controls. P = Mean absorbance of the position controls. S = Absorbance of the test sample.

All absorbance that are greater or equals to 0.232 were considered

Table 1. Overall results of the HCV prevalence in the study area.

Total number of sample	Number of reactive (%)	Number of non-reactive (%)
320	16 (5.0)	304 (95.0)
P-value	0.000**	

Key: ** indicates highly significant.

Table 2. Prevalence of HCV according to Local Government Area.

LGA	Number of reactive (%)	Number of non-reactive (%)
Wudil	5 (6.3)	75 (93.8)
Gaya	5 (6.3)	75 (93.8)
Sumaila	4 (5.0)	76 (95.0)
Takai	2 (2.5)	78 (97.5)
P-value	0.664^{NS}	

Key: NS indicates not significant.

as reactive while all absorbance that were less than 0.232 were considered non-reactive.

Statistical analysis

The data generated in this study was analysed for statistical significance using Pearson Chi–Square with the aid of statistical package for social sciences (SPSS) version 15.0, Chicago incorporation 2007.

RESULTS

Out of 320 blood donors involved in the study 16 (5.0%) were sero-positive to HCV while 304 (95.0%) sero-negative (Table 1). Table 2 depicts the prevalence of HCV according to the LGA. Out of the 80 subjects in each LGA, Gaya and Wudil had the highest prevalence rate of 5(6.3%) each followed by Sumaila 4 (5.0%) and Takai had the least prevalence rate of 2 (2.5%); however this did not reveal statistical significant ($P > 0.05$). Table 3 shows the prevalence of HCV in blood donors in relation to demographical parameters. There were differences across these demographic characteristics; however, all are not statistically significant ($P > 0.05$). The relationship among possible risk factors and HCV infection in Table 4 revealed a significant association in transmission through vertical, receiving injection at time of sickness, history of sexually-transmitted infections (STIs), and alcohol consumption while it indicated a non-significant association in transmission through blood transfusion, history of surgery, history of hepatitis and cigarette smoking. All the donors were found to use new syringe as well as not sharing needle with other people when receiving injection each time as such no disease was recorded in each case.

DISCUSSION

The data on the epidemiology of hepatitis C virus in Nigeria is limited (Ejiofor et al., 2010). However, it has long been suspected that it may be endemic. In the present study, 320 blood donors were screened and 16(5.0%) were sero-positive and all of them were males. This value (5.0%) is lower compared to the findings of Oni and Harrison (1996) who reported a sero-prevalence rate of 8.0% from a study conducted among male adults and children in Nigeria. Another study conducted by Halim and Ajayi (2000) reported a prevalence of 12.3% which is also higher than that obtained in the present study. Chukwurah et al. (2005) also reported a prevalence of 7.6% among blood donors in South-eastern state of Nigeria. Ayolabi et al. (2006) reported a sero-prevalence rate of HCV among blood donors in Lagos, Nigeria to be (8.4%), which is also higher than the one observed in the present study. On the other hand, Beatriz et al. (2000) reported a lower sero-prevalence rate of HCV (1.2%) in the general population of North-western Tanzania. In addition, the finding in the present study is also higher than values ranging between 0 to 1.4% reported from USA and Europe (Alter et al., 1999). These variations could be due the fact that prevalence of HCV greatly differs according to the geographical location of a population. It was indicated that age groups of 24 to 33 and 34 to 43 years had the highest prevalence rate of 6(1.9%) each (Table 3). These age groups represent the sexually-active group of the population hence, showing probably the mode of transmission of the virus. The prevalence rate in relation to the demographic characteristics (Table 3) did not reveal significant association ($P > 0.05$) in all the cases. This means that the characteristics had no effect on the prevalence of HCV even though the prevalence rates were found to

Table 3. Prevalence of HCV according to demographical characteristics of the subjects.

Demographic characteristic	Total number examined (%)	Number of reactive (%)	Number of non-reactive (%)
Sex			
Male	319 (99.7)	16 (5.0)	303 (94.7)
Female	1 (0.3)	0 (0.0)	1 (0.3)
Total	320	16 (5.0)	304 (95)
P-value		0.818^{NS}	
Age group (years)			
14-23	56 (17.5)	1 (0.3)	55 (17.2)
24-33	127 (39.7)	6 (1.9)	121 (37.8)
34-43	91 (28.5)	6 (1.9)	85 (26.6)
44-53	35 (10.9)	3 (0.9)	32 (10.0)
≥54	11 (3.4)	0 (0.0)	11 (3.4)
Total	320	16 (5.0)	304 (95.0)
P-value		0.518^{NS}	
Marital status			
Married	265 (82.8)	14 (4.4)	251 (78.4)
Single	55 (17.2)	2 (0.6)	53 (16.6)
Total	320	16 (5.0)	304 (95.0)
P-value		0.610^{NS}	
Education quality			
None	11 (3.4)	2(0.6)	9 (2.8)
Arabic	113 (35.3)	3(1.0)	110 (34.4)
Primary	82 (25.6)	6(1.9)	76 (23.8)
Secondary	71 (22.2)	3(1.0)	68 (21.3)
Tertiary	43 (13.4)	2(0.6)	41 (12.8)
Total	320	16(5.0)	304 (95.0)
P-value		0.174^{NS}	
Occupation			
Public servant	39 (12.2)	1 (0.3)	38 (11.9)
Unemployed	35 (10.9)	3 (1.0)	32 (10.0)
Self-employed	246 (76.9)	12 (3.8)	234 (73.1)
Total	320	16 (5.0)	304 (95.0)
P-value		0.448^{NS}	
Settlement			
Urban	9(2.8)	0(0.0)	9(2.8)
Semi urban	89(27.8)	3(1.0)	86(26.9)
Rural	222(69.4)	13(4.0)	209(65.3)
Total	320	16(5.0)	304(95.0)
P-value		0.519^{NS}	

Key: NS indicates not significant.

vary across some of the characteristics (Table 3). The most common risk factor of HCV in developing countries like Nigeria is transfusion of unscreened blood or plasma-derived products (Conry-Contelena et al., 1996; Erhabor et al., 2006). In this study, the prevalence rate was related to the history of transfusion among the donors where it was observed that all the cases occurred among the donors that did not receive blood transfusion (Table 4). However, this is at variance with previous reports, where it has been established that HCV is transmitted through blood transfusion. Among the reasons, which cause this disagreement could be that a donor might have been transfused long ago, for example, at child stage, which he was not aware and then responded that he did not receive blood transfusion ever in his life, or he might have been transfused and yet he refused to disclose it. Vertical transmission was reported by Ejiofor et al. (2010) and Jawetz and Adelberg (2007) to occur in the transmission of HCV and this was confirmed in the present study where the prevalence rate occurred higher

Table 4. Prevalence of HCV according to possible risk factors.

Possible risk factor	Total Number (%)	Number of reactive (%)	Number of non-reactive (%)
Blood transfusion			
Yes	5(1.6)	0 (0.0)	5 (1.6)
No	315(98.4)	16 (5.0)	299 (93.4)
Total	320	16 (5.0)	304 (95.0)
P-value		0.605^{NS}	
History of liver disease			
Yes	5 (1.6)	1 (0.3)	3 (0.9)
No	316 (98.7)	15 (4.7)	301 (94.1)
Total	320	16(5.0)	304 (95.0)
P-value		0.065^{NS}	
Surgery before			
Yes	5 (1.6)	1 (0.3)	3 (0.9)
No	316 (98.7)	15 (4.7)	301 (94.1)
Total	320	16(5.0)	304 (95.0)
P-value		0.065^{NS}	
Family history of hepatitis			
Yes	19 (5.9)	9 (2.8)	10 (3.1)
No	301 (94.1)	7 (2.2)	294 (91.9)
Total	320	16(5.0)	304(95.0)
P-value		0.000**	
Medication use			
Injection	218 (68.0)	16 (5.0)	202 (63.1)
Tablet	102 (31.9)	0 (0.0)	102 (31.9)
Total	320	16(5.0)	304 (95.0)
P-value		0.005**	
New syringe or re-usable			
New syringe	320 (100)	16 (5.0)	304 (95.0)
Re-usable	0 (0.0)	0 (0.0)	0 (0.0)
Total	320	16 (5.0)	304 (95.0)
P-value		.a	
Sharing needle			
Yes	0 (0.0)	0 (0.0)	0 (0.0)
No	320 (100)	16 (5.0)	304 (95.0)
Total	320 (100)	16 (5.0)	304 (95.0)
P-value		.a	
Suffered from STI before			
Yes	1 (0.3)	1 (0.3)	0 (0.0)
No	319 (99.7)	15 (4.7)	304 (95.0)
Total	320	16 (5.0)	304 (95.0)
P-value		0.000**	
Alcohol consumption			
Yes	4 (1.3)	3 (0.9)	1 (0.3)

Key: **, indicates highly significant. *, indicates significant. ^{NS}, indicates not significant, .a indicates inability of computing statistics because of one variable is constant.

in the donors who had the family history of hepatitis infection and statistical analysis revealed a highly significant association ($P < 0.01$). Ejiofor et al. (2010) and Sheyin et al. (2011) also reported alcohol consumption among factors that affect disease progression and this was identified in the present study where the relationship between the prevalence rate of HCV and alcohol consumption was found to be statistically significant ($P < 0.01$). However, alcohol consumption was found to be a separate factor that plays a role in the progressive transmission of the disease. There is no statistical significant association between cigarette smoking and

Table 4. contd.

No	316 (98.7)	13 (4.1)	303 (94.7)
Total	320	16 (5.0)	304 (95.0)
P-Value		0.000**	
Cigarette smoking			
Yes	9 (2.8)	0 (0.0)	0 (0.0)
No	311 (97.2)	15 (4.7)	296 (92.5)
Total	320	16 (5.0)	304 (95.0)
P-value		0.394^{NS}	

Key: ** indicates highly significant. * indicates significant. ^{NS} indicates not significant. .a indicates inability of computing statistics because of one variable is constant.

HCV infections as such had no effect on the prevalence rate of HCV infection as observed in this study.

Conclusion

This study indicated a significant prevalence rate among blood donors, screening blood donors for HCV infection has not been properly incorporated in some blood banks, of public health facilities as well as private heath institutions; there is no statistical association between HCV prevalence and demography as well as some possible risk factors. Vertical transmission of HCV was identified in this study.

RECOMMENDATIONS

There is need to institute national public health intervention programs that will involve mandatory screening of blood and blood products especially for HCV before transfusion and also to promote health education in HCV infection and its prevalence. Government should try to provide vaccines against HCV as it is done with other deadly diseases like polio, measles, HBV, whooping cough, etc. so as to help the citizens in reducing the spread of the disease.

ACKNOWLEDGEMENTS

The authors acknowledge the assistance of the entire medical laboratory scientists, technicians and assistants at Wudil, Gaya, Sumail and Takai General Hospitals, and also Mallam Adamu Sarki and Mallam Nasiru Magaji, both of Microbiology Unit, Department of Pathology, Aminu Kano Teaching Hospital, Kano, Nigeria for their technical assistance.

REFERENCES

Alter MJ, Kruszon-Moran P, Nainan OV (1999). The prevalence of Hepatitis C virus infection in the United States (1988 –1994). New Engl. J. Med., 341:556-62.

Ayolabi CI, Taiwo MA, Omilabu SA, Abebisi AO, Fatoba OM (2006). Sero-prevalence of Hepatitis C virus among blood donors in Lagos, Nigeria. Afr. J. Biotechnol., 5(20):1944–46.

Beatriz HT, Arthur L, Glen B, John S, James ED, Harvey JA, Thomas RO (2000). Sero-prevalence of Hepatitis C virus in the general population of north-western Tanzania. Am. J. Trop. Med. Hyg., 62(1): 138–41.

Cheesbrough M (2005). In collection of blood for Hepatitis C Virus. District laboratory practice in tropical countries - Part 2. Cambridge University Press, UK. Pp 296- 357.

Choo Q, Kuo G, Weiner A, Overby L, Bradley D, Houghton M (1989). Isolation of a CDNA clone derived from a blood-borne non-A, non-B viral hepatitis genome. Science, 244(4902): 59-62.

Chukwurah EF, Ogbodo SO, Obi GO (2005). Sero-prevalence of Hepatitis C virus (HCV) infection among blood donors in south-eastern State of Nigeria. Biomed. Res., 16(2): 133–135.

Conry–Contelena C, Vanraden M, Gibble J (1996). Routes of infection, viraemia and liver disease in blood donors found to have Hepatitis C virus infection. New Engl. J. Med., 336: 919 – 22

Cox AL, Netski DM, Mostbruger T (2005). Prospective evaluation of community-acquired acute Hepatitis C virus infection. Clin. Infect. Dis., 40(7):951–958.

Darius M, Andrew C, Markus HH, Hubert EB (2001). Hepatitis C: An update. Swiss Med. Weekly 131:291–298.

Ejiofor OS, Emechebe GO, Igwe WC, Ifeadike CO, Ubajaka CF (2010). Hepatitis C virus infection in Nigerians. Nig. Med. J., 51:173–176.

Erhabor O, Ejele OA, Nwauche CA (2006). The Risk of transfusion-acquired Hepatitis C virus infection among blood donors in Port Harcourt: The question of blood safety in Nigeria. Nig. J. Clin. Pract., 9:18-22.

Farci P (1991). A long-term study of Hepatitis C virus replication in non–A, non–B hepatitis. New Engl. J. Med., 162: 1201 – 1205.

Jawetz M, Adelberg (2007). Hepatitis viruses. Medical microbiology. 24th Edition. McGraw-Hill publishers, UK. Pp466-485.

Halim NK, Ajayi OI (2000). Risk factors and sero-prevalence of Hepatitis C antibody in blood donors in Nigeria. East Afr. Med. J., 77:410–412.

Howard JW (2002). The Hepatitis C source book. Amer. J. Infect. Control 8:1–9.

Lansing MP, Donald AK (2000). Microbiology. 4th edition. WCB MacGraw–Hill publishers, New Delhi, India. Pp759–760.

Okafor GO, Obi GO (1979). The incidence of Hepatitis B surface antigen in Nigeria. Trans. Royal Soc. Trop. Med. Hyg., 73:648.

Oni AO, Harrison TJ (1996). Genotypes of Hepatitis C virus in Nigeria. J. Med. Vir., 49:178–286.

Rogo LD (2011). Genetic and molecular basis for Hepatitis C virus resistance to some anti-retroviral drugs: A review. Biol. Environ. Sci. J. Trop., 8(2):112-118.

Sheyin Z, Jatau ED, Mamman AI, Randawa AJ (2011). Risk factors associated with prevalence of Hepatitis C virus in Kaduna State, Nigeria. Biol. Environ. Sci. J. Trop., 8(3):264-266.

Journal of Public Health and Epidemiology Vol. 4(6), pp. 184-188, June 2012
Available online at http://www.academicjournals.org/JPHE
DOI: 10.5897/JPHE11.140
ISSN 2141-2316 ©2012 Academic Journals

Full Length Research Paper

The perception and beliefs on tuberculosis among traditional healers in Remo North Local Government Area, Ogun State, Southwestern Nigeria

Albert Adekunle Salako and O. O. Sholeye

Obafemi Awolowo College of Health Sciences, Olabisi Onabanjo University, Ogun State, Nigeria.
Department of Community Medicine, Olabisi Onabanjo University Teaching Hospital, Sagamu, Ogun State, Nigeria.

Accepted 30 December, 2011

With the aid of a pre-tested semi-structured interview questionnaire, 30 traditional healers in Remo North Local Government Area of Ogun State in the Southwestern part of Nigeria were identified by their certificate of apprenticeship. A cross-sectional study was carried out to assess their knowledge on the symptoms of tuberculosis, their perceptions, beliefs and their practices as regards to the management of tuberculosis. A large percentage (60.0%) of the traditional healers knew the symptoms of tuberculosis but did not refer to the hospital because they believed that the disease is due to witchcraft, spells, poisons, eating forbidden food, familial causes, alcohol, cigarette smoking or mystical causes, and 70.0% rely on herbal concoctions to treat the disease. Intensive tuberculosis health education should be extended to traditional healers. Government through public health institutions should mobilize health educators and organize workshops to educate the traditional healers about tuberculosis. The referral system should be improved- that is, via these organized workshops. The traditional healers need to be conversant with early signs and symptoms of tuberculosis for early referral to the appropriate health institutions.

Key words: Tuberculosis, perception, tuberculosis health education, referral system.

INTRODUCTION

Tuberculosis (TB) is a chronic infectious disease in human beings caused by *Mycobacterium tuberculosis*, and it is transmitted from man to man mainly by droplet inhalation when the infectious agent is coughed into the air, and also through contact; thus making it a disease of public health importance. However, tuberculosis remains a public health problem especially in developing countries. In spite of control activities in Nigeria since 1942, TB control objectives do not seem to have been achieved. This disease is one of humanity's most ancient plagues with well documented cases having been found in both the old world (Egyptian) and the new world (Peruvian) mummies. (Warren and Mahmoud, 1985).

Over the past two to three centuries, TB has been responsible for approximately one billion human deaths. It kills 1.5 million people each year. (CORE Group, 2008). It is one of the leading global causes of morbidity and mortality (Iademarco and Castro, 2003). Today, tuberculosis remains common throughout most of the world with one-third of the world's population estimated to be infected with it. It remains a major public health problem in developing countries, contributing greatly to the burden of disease (WHO, 2010a b, 2011,). Various studies have focused on the knowledge, perception and health-seeking behavior of communities to accessing qualitative care (Nkulu et al., 2010; Legesse et al., 2010; Abebe et al., 2010; Rintiswati et al., 2009). A well-established fact is that cultural beliefs affect health-seeking behavior as well as interpretation of symptoms. Traditional names were given to the disease in different languages to recognize it's long term nature- "consumption" in English, "Chakhotka" (declining) in Russia and "assul" (stealing away) in Arabic (Ruck, 1997).

*Corresponding author. E-mail: adesalako768@yahoo.com.

The tubercle bacillus was first isolated by Robert Koch in 1882 (Pearson, 1982). Further researches were carried out to discover more about the disease and how it could be treated. In 1945, Feldman and Hinshaw discovered that streptomycin was effective for the treatment of tuberculosis in man. Ever since then, a number of other anti-microbial agents suitable for the treatment of this disease in humans have been developed. In the early 19th century, two French scientists, Calmette and Guerin, developed BCG-Bacille Calmette Guerin vaccine which is a preventive measure against tuberculosis. With BCG, the incidence of tuberculosis is reduced by as much as 80%, and the degree of protection will last for many years.WHO's recommended approach for treating tuberculosis is DOTS (Directly Observed Treatment Short course) and a major campaign run by WHO's global TB programme is actively promoting its use. Yet, worldwide, only some 10% of TB patients are receiving DOTS, and in Africa only 23% of TB patients are estimated to receive DOTS overall (Paul, 1997).

Despite the discovery of the infectious agent of TB almost a hundred and twenty years ago and with all the break-through in prevention and treatment, and the still continuing efforts to improve diagnosis and treatment of TB, the prevalence of the disease is increasing worldwide. This is because a large number of TB patients present themselves first at the traditional healers' place, and if at all they are present at any health facility, they present late. It is therefore, important to note that 75% of Africa's populations (Tella, 1980) live in the rural areas, and they have great faith in traditional medicine because it takes account of their particular socio-cultural backgrounds, hence, they tend to go to the traditional healers for treatment of the disease conditions which they should ordinarily have brought to the hospital.The rationale behind this study is to be able to improve the TB referral system, such that these patients who present themselves to the traditional healers first can be referred to health facilities nearest to them so that they are treated and cured early instead of presenting after complications might have set in.The objectives of this study was to determine the characteristics of the traditional healers and the verification of their practice; to collect information about their knowledge on the symptoms, causes and management of TB, including their perceptions and attitude toward orthodox management of TB; to make recommendations on how the traditional healers can receive adequate health education on TB; to enhance identification of cases for prompt referral to health facilities (that is, improving the referral system).

MATERIALS AND METHODS

Background to study: The community

Remo North Local Government Area was created in December, 4th 1996 out of the old Ikenne Local Government Area. The local government area is located in the rain forest region of Southwestern Nigeria and is bounded in the west by Obafemi/Owode Local Government Area, in the North by Oyo State, in the South by Ikenne Local Government Area, and in the East by Ijebu-North Local Government Area.

The inhabitants are Remos and few settlers from Igbo, Igede and Hausa tribes. The estimated population of the local government area is about 59, 157. The population distribution is 60% urban and 40% rural. Under the local government area are major towns like Isara, Ode Remo, Ipara, Ilara, Akaka and numerous villages. Majority of the people within the local government area are poor with few rich ones and middle class. They engage in farming and trading with few artisans viz; motor mechanics, photographers, panel beaters, welders, radio technicians and tailors. They grow the usual food and cash crops within the rainforest vegetation of Nigeria for example, cocoa, oil palm produce, kolanuts, cassava, maize, cocoyam, cowpea, plantain, oranges, etc. They also engage in animal production- poultry, fishery, pigs, snails and rabbit rearing.

The people are mostly Christians, Muslims and Traditionalists with seven Obas as the heads. The level of literacy is average. The staple foods of the local government area include Ebiripo, Ikokore, Eba, Fufu, and Iyan.There are 8 health clinics, one General Hospital and many private health institutions within the local government area. Also, there are 21 primary schools, 9 secondary schools, and 2 tertiary institutions within the local government area. There are 3 commercial banks and a recreational facility. There is NITEL (Nigeria Telecommunications) and NIPOST within the local government area. Visual and audio-visual aids are common among the people both in the rural and urban areas of the local government. The electric power supply from NEPA (National Electric Power Authority) is below average, thus discouraging establishment of industries in the area.The transportation system within the villages is poor but there is an express road which links the major towns within the local government area. Access roads to the villages are rough and crooked, and the main means of transportation are motorcycles and bicycles.For water supply, bore holes and deep wells are constructed by the government, non-governmental organizations and individuals in the local government area. There is no pipe-borne water supply to the area.Consent was taken from the local government area office at Isara, and the traditional healers were pointed out by the local government officials by virtue of the fact that they live within the local government area.With the aid of a pre-tested semi-structured interview questionnaire, 30 traditional healers in Remo North local government identified by their certificate of apprenticeship, a descriptive and cross-sectional study was carried out to assess their knowledge in the symptoms of TB, their perceptions, beliefs and their practices as regards the management of TB.

The study design was descriptive, and information was collected from the traditional healers using interviewer-administered questionnaires; and they were interviewed as seen. The questionnaire used in this study was a semi-structured.

RESULTS AND DISCUSSION

A total of 30 traditional healers were involved in the study. Twenty-eight (93.3%) of the respondents were males and 2 (6.7%) were females. The age group, 70 to 79 years constitute the largest group accounting for 30.0% of the respondents. The distribution of the

Table 1. Distribution of respondents by age and sex.

Age (years)	Sex		Total (%)
	No. of males (%)	No. of females (%)	
20-29	1 (3.3)	0 (0.0)	1 (3.3)
30-39	5 (16.7)	0 (0.0)	5 (16.7)
40-49	4 (13.3)	0 (0.0)	4 (13.3)
50-59	2 (6.7)	0 (0.0)	2 (6.7)
60-69	5 (16.7)	2 (6.7)	7 (23.3)
70-79	9 (30.0)	0 (0.0)	9 (30.0)
80-89	1 (3.3)	0 (0.0)	1 (3.3)
90-99	0 (0.0)	0 (0.0)	0 (0.0)
>100	1 (3.3)	0 (0.0)	1 (3.3)
Total	28 (93.3)	2 (6.7)	30 (100.0)

respondents by educational status were as follows, 12 (40.0%) had no education, 4 (13.3%) did not complete primary education, 5 (16.7%) completed primary education, 2(6.7%) did not complete secondary education. Four (13.3%) completed secondary education while 3 (10.0%) had post secondary education.

By religion, 11(36.7%) were Christians, 10 (33.3%) were Muslims while 9 (30.0%) were traditionalists. 60.0% of the respondent traditional healers understand tuberculosis to be a disease associated with cough, weight loss and chest pain'.By the mode of spread of tuberculosis, 11(36.7%) believed that tuberculosis can be spread by the oral route, 2 (6.7%) responded that it runs in families (familial), 5 (16.7%) sharing of foamites, witchcraft 2 (6.7%), while 10 (33.3%) had no idea of the mode of spread. The majority of the traditional healers fall in the age group 70 to 79 years and are males, while the females who are the minority are found in the age-group 60 to 69 years (Table 1). This is to show that this is a male-dominated profession. And for the age group 20 to 29 years and those of 80 years and above are not well represented probably because the traditional healers in older age groups are dying off and the younger ones are yet to be trained or still under training.A large percentage (40.0%) of the traditional healers are not educated, 16.7% of them completed primary school, 13.3% did not complete primary school, and another 13.3% completed secondary school, 10.0% of them had post-secondary school education and the remaining 6.7% did not complete secondary school.Many of these traditional healers are either Muslims, Christians or Traditionalists, with the Christians accounting for 36.7% of the respondents, the Muslims 33.3% and the Traditionalists accounted for 30.0%. The World Health Organization Expert Committee defines a traditional healer as (that) person who is recognized by the community in which he lives as competent to provide health care using vegetable, animal, and mineral substances and certain methods based on the social, cultural and religious backgrounds as well as knowledge, attitudes and beliefs that are prevalent in the community regarding physical, mental and social well-being and the causation of disease and disability. (WHO, 1978; (Erinosho, 1998).

Indigenous native healers are variously known as *Babalawo, Onisegun and Adahunse* among the Yoruba. The knowledge base for the practice of medicine of these healers derives mainly from their traditional world-view, myths and beliefs, including healing techniques which have been handed over the centuries from one generation to another. Some healers are merely diviners while others combine this skill with the use of their extensive knowledge of medicinal herbs (Erinosho, 1998). Past studies have indicated the numerical strength of these healers, suggesting that they are preponderant. In a report, Ademuwagun (1969) claimed that close to 10% of rural and 4% of urban dwellers are traditional healers. His assertion concerning their numerical strength clearly indicates that they are greater in number than formally trained cosmopolitan western-style physicians and that they are, as such, more readily accessible to the general populace than the latter (Erinosho, 1998). It is not surprising therefore, that tuberculosis patients approach them in view of their easy accessibility in the community. It is therefore important that these traditional healers are conversant with the signs and symptoms of this deadly common communicable disease which scientists have proved curable by orthodox methods. The traditional healers can contribute immensely to the control of this preventable communicable disease by the early recognition and prompt referral to DOTS centres for appropriate management to ensure adequate control of the disease.It is estimated that one-third of the world's population is infected by *M. tuberculosis* and that 8 million new cases of active TB and 2.6 to 2.9 million TB related deaths occur each year (Mugerwa, 1998). In areas of high tuberculosis incidence, the disease is primarily a disease of young adults. Epidemiological factors associated with

Table 2. Distribution of the respondents by causes of tuberculosis (aetiology).

Responses	Frequency	Percent (%)
Unnatural (Witchcraft and mystical causes, no idea)	16	53.3
Familial	5	16.7
Infectious, contact with TB patients	2	6.7
Poisons, eating forbidden food	5	16.7
Alcohol and cigarette smoking	2	6.7
Total	30	100.0

Table 3. Distribution of respondents by their methods of preventing tuberculosis.

Responses	Frequency		Total (%)
	Yes (%)	No (%)	
Immunization of children with BCG	11 (36.7)	19 (63.3)	30 (100.0)
Discourage over-crowding around patient	14 (46.7)	16 (53.3)	30 (100.0)
Improve ventilation	8 (26.7)	22 (73.3)	30 (100.0)
Taking patient with prolonged cough to hospital for treatment	7 (23.3)	23 (76.7)	30 (100.0)

TB are age, poverty, overcrowding, poor living conditions, urban living, and malnutrition. Famines have also been associated with soaring TB mortality rates. Also, HIV/AIDS infection is also associated with TB (Warren and Mahmoud, 1985).

The profound immuno-suppression resulting from HIV infection confers the greatest risk known for reactivation of latent TB infection and for progression of recent TB infection to active TB. The immune suppression caused by HIV facilitates the multiplication and spread of mycobacterium leading to progressive disease. This will lead to spread of both drug-sensitive and drug-resistant mycobacterium through nosochromial contact. Thus, from a public health stand point, TB is the most serious and life threatening complication of AIDS, because of the potential to spread disease in both HIV and non-HIV infect.The manifestations of tuberculosis obtained from this study were cough, weight loss and chest pain. This agrees with the work of Youmans (1976) who wrote that if pleuritic involvement accompanies the primary infection or the primary infection becomes progressive, localizing symptoms of cough, chest pain and subsequent increase in fever may be observed. He then went further to write that weight loss and night sweats are some of the manifestations which are more common than all the localizing symptoms except cough.The aetiology of tuberculosis as obtained from these traditional healers interviewed included witchcraft and mystical causes, poisons and forbidden foods and familial causes as shown in Table 2. Only 2 (6.7%) of the respondents correctly mentioned that it is caused by an infective agent. In 1882 Robert Koch discovered that the tubercle bacillus, *M. tuberculosis* is the infective agent of the disease. Twenty (66.7%) of the traditional healers agreed that tuberculosis is found in both cities and rural areas. This agrees with the works of Youmans (1976) and that of Warren and Mahmoud (1985). Youmans found that most TB is found in those areas of the cities where there is overpopulation, overcrowding and lower standards of personal hygiene and sanitation. Mahmoud and Warren reported that TB is widely distributed in rural areas.

In terms of the prevention of the disease, a large percentage of the traditional healers do not believe that the BCG vaccine can protect against TB (as outlined in Table 3). This disagrees with the report by Warren and Mahmoud that BCG vaccination against TB has helped to reduce the incidence of TB by as much as 80%. This study also showed that by discouraging overcrowding around patients and improving ventilation, the spread of TB cannot be prevented; this does not compare with the work of Ruck (1997) that overcrowding and poor living conditions are some of the epidemiological factors of TB.

Twenty-one (70%) of the traditional healers treat TB by administering herbal concoction to TB patients (as highlighted in Table 4). This is inconsistent with the WHO recommended treatment for TB which is DOTS-Directly Observed Treatment Short course. Just 10% of the respondents refer patients to the hospital. From this study, recurrent TB is claimed to be due to non-compliance to herbal concoction on the part of the patients this is presented in Table 5. This disagrees with the studies carried out that recurrent TB (which could be in form of reactivated old TB or re-infection) is due to non-compliance to anti-TB drugs, and lowered immunity against infection.

Twenty-two (73.3%) of the traditional healers treat recurrent TB by the administration of herbal concoction as recorded in Table 6. This is not in line with the WHO

Table 4. Distribution of respondents by their methods of management of tuberculosis.

Responses	Frequency	Percent (%)
Herbal concoction	21	70.0
Recite incantations	1	3.3
Refer to Hospital	3	10.0
Others	5	16.7
Total	30	100.0

Table 5. Distribution of respondents by causes of recurrent tuberculosis.

Responses	Frequency	Percent (%)
No idea	21	70.0
Poor diet and strenuous work	1	3.3
Witchcraft	1	3.3
Non-compliance with herbal medication	6	20.0
Cigarette smoking and alcohol	1	3.3
Total	30	100.0

Table 6. Distribution of respondents by management of recurrent tuberculosis.

Responses	Frequency	Percent (%)
Herbal concoction	22	73.3
Refer to hospital for treatment	3	10.0
Others		16.7
Total	30	100.0

recommended use of anti-tuberculosis drugs under a re-treatment regimen. All what is required is prompt referral to the appropriate DOTS centres.

Intensive tuberculosis health education should be extended to traditional healers. Government through public health institutions should mobilize health educators and organize workshops to educate the traditional healers about TB. The referral system should be improved- that is, via these organized workshops. The traditional healers need to be conversant with early signs and symptoms of TB for early referral to the appropriate health institutions.

REFERENCES

Iademarco MF, Castro KG (2003). Epidemiology of Tuberculosis Semin Resp. Infect., 18(4): 225-240.

Largesse M, Ameni G, Mamo G, Medhin G, Shawel D, Bjune G (2010). Knowledge and perception of pulmonary tuberculosis in pastoral communities in the middle and lower Awash Valley of Afar region, Ethipoia. BMC Public Health, 10: 187.

Nkulu FK, Hurtig A, Ahim C, Krantz I (2010). Screening migrants for tuberculosis- a missed opportunity for improving knowledge and attitudes in high-risk groups. A cross-sectional study of Swedish-language students in Umea, Sweden. BMC Public Health, 10: 349

Rintiswati N, Mahendrodhata Y, van der Werf MJ (2009). Journeys to. tuberculosis treatment: a qualitative study of patients, families and communities in Jogjakarta, Indonesia. BMC Public Health, 9: 158.

World Health Organisation (2010). Global Tuberculosis Control: WHO Report 2010. Geneva. WHO.

World Health Organisation (2010) World health statistics. Geneva. WHO.

World Health Organisation (2011). Global Tuberculosis Control: WHO Report. Geneva. WHO.

Abebe G, Deribew A, Apers L, Weldemichael K, Shiffa J, Tesfaye M (2010). Knowledge, health-seeking behavior and perceived stigma towards Tuberculosis, among tuberculosis suspects in a rural community in southwest Ethiopia. PLoS One. 5(10): 13339.

Warren KS, Mahmoud AAF (1985). Tuberculosis. In Tropical and Geographical Medicine. International Student Edition McGraw Hill Book Co. pp. 787-796.

Ruck N (1997). Human Factors in the TB epidemic. J. Afr. Health, 20(1): 23-24.

Pearson Bryan (1982) TB: We Have The Means But Do We Have The Will? J. Africa. Health. 4: 5.

Tella A (1980). The role of African traditional healers. J. Afr. Health., 2(6): 28-29.

Erinosho OA (1998). Traditional Therapeutics and System of Care. In Health Sociology first edition Ibadan: Sam Bookman Educational and Communication Services. pp. 55-57.

Mugerwa RD (1998). Tuberculosis in the era of HIV: problem, challenges and hopes for Africa. J. Afri. Health, 20(6): 23-26.

Youmans GP (1976). Tuberculosis. In Tropical Medicine. Fifth Edition Philadelphia: W.B. Saunders Co. pp. 193-210.

UPCOMING CONFERENCES

2nd International Congress on Neurology and Epidemiology, Nice, France, 8-10 November 2012

The 2nd IASTED African Conference on Health Informatics

~AfricaHI 2012~

Conferences and Advert

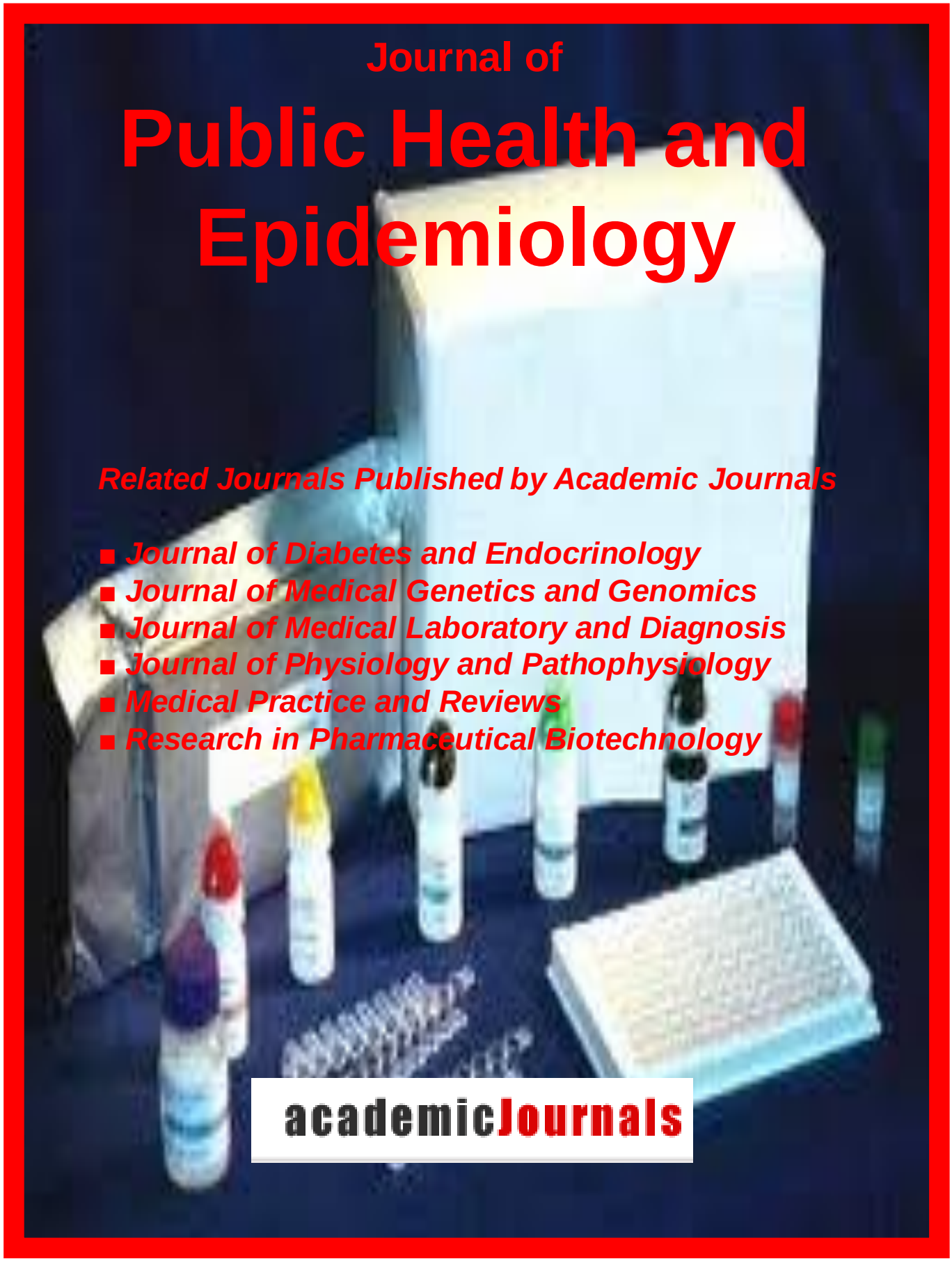
May 2012
8th Annual World Health Care Congress, Amsterdam, Netherlands, 23 May 2012

July 2012
1st Asia Pacific Clinical Epidemiology and Evidence Based Medicine Conference (APCEEBM), Kuala Lumpur, Malaysia, 6 Jul 2012

September 2012
2nd African Conference on Health Informatics, Gaborone, Botswana, 5 Sep 2012

November 2012
2nd Congress on Neurology and Epidemiology, Nice, France, 8 Nov 2012

1st National Sexual and Reproductive Health Conference (NSRHC) Melbourne, Australia, 20 Nov 2012


Journal of
Public Health and Epidemiology
Related Journals Published by Academic Journals
■ Journal of Diabetes and Endocrinology
■ Journal of Medical Genetics and Genomics
■ Journal of Medical Laboratory and Diagnosis
■ Journal of Physiology and Pathophysiology
■ Medical Practice and Reviews
■ Research in Pharmaceutical Biotechnology
academicJournals