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Full Length Research Paper

Social implications of hematuria on women for schistosomiasis control

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Hematuria associated with urinary schistosomiasis has been misconstrued for certain superstitious beliefs in some local communities in Nigeria and elsewhere. Hematuria and its social implications, especially on women, may have a negative impact on schistosomiasis control measures. Some of the limitations of the national programme on Schistosomiasis control are highlighted. This paper also reviews the effect of stigma due to hematuria on the woman as it affects the domestic role of the woman in health care delivery at household levels. A revised national policy is suggested for an effective control of schistosomiasis and hence hematuria. For the new policy to be successful, a National survey to identify areas endemic for schistosomiasis is important. Other factors of control bordering on environmental sanity and provision of adequate social amenities are discussed.

Key words: Hematuria, schistosomiasis, woman, stigma.

INTRODUCTION

Schistosomiasis is a major parasitic disease causing considerable morbidity and mortality in many tropical and subtropical countries. In Nigeria, urinary schistosomiasis caused by the trematode, *Schistosoma haematobium* has been reported to be the dominant form of schistosomiasis (Adeoye and Akabogu, 1996). The infection is a chronic and debilitating disease commonly associated with rural agricultural communities with low standard of living and poor sanitary conditions. The infection has also been reported in some urban communities (Okoli and Odaibo, 1999). About 200 million people in 74 countries are infected and at least another 600 million are at risk of infection (World Health Organization (WHO), 1995).

Individuals infected by *S. haematobium* have been reported to frequently experience dysuria, pelvic pain and hematuria (Satayathum et al., 2006). Hematuria which simply means blood in urine has been reported to be common with urinary schistosomiasis. Hematuria has also been associated with anemia and poor health condition. Many patients with urinary schistosomiasis may also experience associated squamous, cell carcinoma and renal disease (van der Werf et al., 2003). Cases of hematuria have been documented in Nigeria and some other parts of Africa (Nwaorgu, 1992; Feldmier

et al., 1993). Hematuria has been associated with local cultural beliefs resulting in stigmatization of infected persons. Akogun and Obadiah (1996) reported that hematuria in female was wrongly likened to irregular menstrual cycle or a symptom of venereal disease in some rural communities in Nigeria. Also, Adamu and Abubakar (2003) observed that hematuria was misconstrued as a sexually transmitted disease in females and as a taboo, evil spirit attack and a sign of maturity in males. The social stigma resulting from hematuria is definitely greater in the female folks than in the males. This is because in rural communities, where most of the women are illiterate, stigma due to hematuria could lead to rejection by her family members and the community at large. Rejection has a lot of social implications. Weiss (2008) reported that stigma is a social burden of any neglected tropical disease and that it would exclude affected persons from social life which may hinder treatment-seeking behaviours.

Although the occurrence of urinary schistosomiasis in several parts of Nigeria has been documented, outbreaks of the infection are still being reported in Nigeria (Nwabueze and Opara, 2007; Adeoye et al., 2009). In view of the role of the woman as health care provider for

her family, there is a need to examine critically the social implications of hematuria on women and its effect on schistosomiasis control.

Policy

Hematuria due to urinary schistosomiasis is only one of the symptoms of the disease. For hematuria and its associated social implications to be a thing of the past, schistosomiasis has to be brought under control. Schistosomiasis has been reported to be hyper-endemic in Nigeria (Mafe et al., 2005). The National policy on schistosomiasis control has been that of provision and administration of praziquantel, the drug of choice to persons in endemic areas. Richard et al. (2006) noted that control activities could not be effectively integrated because of restrictive guidelines on drug administration and the cost of praziquantel. Also, there is yet no mapping of the country to identify endemic areas. Furthermore, the best delivery channel for praziquantel is still to be determined. These have affected the mass drug administration programmes.

Pablo's-Mendez et al. (2005) argued that research must be a part of the strategic process which will move evidence-based control interventions to true practice. It has also been noted that national policies on the control of other parasitic diseases such as onchocerciasis, lymphatic filariasis and Human immunodeficiency virus/Acquired immune deficiency syndrome (HIV/AIDS) have diverted attention from the control of schistosomiasis (Richard et al., 2001; Nale et al., 2003). Schistosomiasis as a neglected tropical disease needs to be controlled to avoid risk factors and other complications of the disease in later life. The national policy on schistosomiasis control has been beset with a lot of difficulties. There is a need to assess the successes achieved so far and to address the limitations of the control programme. This should not be left for the government alone. All stakeholders should work together to come up with a better policy and effective implementation of the control programme. This will make way for a better future for all. Therefore, everyone involved in the control of schistosomiasis must be abreast with an understanding of the relevant issues in the control.

Relevant issues

An effective programme for prevention and control of schistosomiasis is necessary in order to put an end to hematuria and its associated stigma, especially on women. However, measures aimed at the prevention and control of schistosomiasis in Nigeria has not been effective. Some of the relevant issues of schistosomiasis control are discussed:

Need for a national survey

Apart from the provision of free antischistosomal drugs by the government, there is a need for a national survey to identify endemic areas in the country. Efforts made to identify endemic areas at a national level are still not conclusive due to environmental changes. Ekpo et al. (2008) applied the use of geographical information system and predictive risk maps in identifying areas endemic for urinary schistosomiasis in Ogun State. Similar studies when carried out in other States of the country will ensure effective control of urinary schistosomiasis. However, visitation of endemic sites on mapping should be conducted for effective monitoring and control of schistosomiasis.

Social implications of hematuria

In rural communities where most women are illiterate, stigma due to hematuria may result in rejection, which can lead to loss of social network, loss of work, difficulty in finding marriage partners, divorce, loss of reputation, decimation, isolation and ostracism among other ills (Link and Phelan, 2001; Weiss and Ramakrishna, 2006). It is therefore important for the women and inhabitants of any rural or any communities to understand the interactions between the parasite, the host and the environment. Takougang et al. (2004) reported serious misconceptions among women on how schistosomiasis was acquired. Knowledge of the mode of transmission of schistosomiasis is crucial in determining the vulnerable links at which intervention by stakeholders, including the women, will produce optimal outcome. Also, there is a need to add morals to cultural beliefs in order to reduce the stigma associated with tropical diseases (Hsin-Yang et al., 2007). The woman should be educated and informed on the course of urinary schistosomiasis and the associated symptom, hematuria.

Muela et al. (2009) recommended that public health programmes should be used in fighting stigma through sensitization campaigns. The Ministry of Environment and its parastatal, Waste Management Board, should ensure the maintenance of environmental cleanliness in every area of the country. Also, the Rural Water Supply and Sanitation Agency, under the umbrella of the Ministry of Water Source Development should provide good and adequate water supply, especially in rural communities that are endemic for schistosomiasis. Their efforts will complement the activities of the Ministry of Health in the prevention and control of spread of schistosomiasis. Proper information regarding hematuria will allay superstitious beliefs about the disease and help to alienate the stigma associated with the disease. The ability of the woman to protect herself and family members from disease is contingent on her access to proper information on prevention and treatment strategies.

Transmission of schistosomiasis

Schistosomiasis is a water-borne parasitic disease transmitted by fresh water snails of the genus *Bulinus*. The causative agent, *S. haematobium* passes its life cycle in two hosts: the definite host which is usually man while the larvae develop in a snail intermediate host, *Bulinus globosus*. The terminal spined ova of *S. haematobium* are passed in urine and when in fresh water hatches, releasing ciliated larvae, miracidia. The hatching mechanism has been described by Edungbola et al. (1996). The miracidium penetrates the soft tissues of the snail and ultimately makes its way to the liver where it undergoes further development to produce cercariae within 4 to 8 weeks. Cercariae emerge from the snail in swarms, especially in the morning because they are phototropic. Daily emergence continues for several weeks and each cercariae must reach a definitive host (man) within 24 h or die. Humans become infected through direct penetration of the skin by cercariae which invade the circulatory system with eggs of the parasites deposited in the blood vessels supplying the urinary bladder (WHO, 1996). Eggs deposited in the bladder may cause ulceration of the tissues of the bladder which results in the passage of blood along with urine. Urinary schistosomiasis may lead to dysuria and hematuria in both acute and chronic schistosomiasis. Unsanitary habits such as passing out of schistosome egg-laden urine into water bodies harbouring appropriate snail host continues another cycle of transmission.

Cost of antischistosomal drugs

The cost of drug may hinder effective treatment of persons. The Nigerian government, through the Ministry of Health, provides free drugs for persons in endemic areas. However, the drugs are not effectively distributed because of problems of standardized delivery channels. Due to the high cost of praziquantel, a call for more donors should be made. Non-governmental organizations (NGOs) can be of assistance in this regard. Individuals, especially in endemic areas, could also make efforts to procure the drugs if government aid is slow in coming. Richard et al. (2006) reiterated that the cost of praziquantel will continue to limit the extent to which schistosomiasis control activities will be successful until there is a cheaper and or donated source.

Schistosomiasis as a neglected tropical disease

According to Ottensen (2002), schistosomiasis control is lagging behind other programmes for control of parasitic diseases such as onchocerciasis and lymphatic filariasis control in the country. A simultaneous treatment of the trio of schistosomiasis, onchocerciasis and lymphatic filariasis will be more cost effective and easier for

community-based mass drug distribution programmes.

Improvement in standard of living and environmental sanity

Standard of living and sanitary conditions of the environment are factors of infection that could enhance growth and proliferation of snail intermediate host of schistosomes. The rural nature of some communities with unhealthy and unhygienic methods of waste disposal create environmental friendly habitat for the abundance of intermediate snail hosts which for urinary schistosomiasis, are the *Bulinus* snails. Lack and inadequate supply of good portable water could encourage infection. The inhabitant of communities with water supply problems may be driven to depend on nearby natural sources of water supply such as rivers, streams and springs which may harbour these *Bulinus* snails. This snail has been reported to use vegetation cover along the banks of water bodies as spawning substrates, nursery sites and for food (Petr, 1990). Water contact activity of persons in endemic areas has been reported as a major reason for infection. Regular visits to streams in dry months especially for domestic chores and other activities resulted in higher rate of infection than in the wet months which had reduced visits to the streams (Nwabueze et al., 2009).

CURRENT EFFORTS AND IMPLICATIONS

Schistosomiasis is a public health problem in Nigeria. The infection has been ranked the second most important parasitic disease in developing countries (WHO, 1985). There is yet no vaccine for the prevention of schistosomiasis. However, various approaches such as the use of chemotherapy and surgical procedures have been tried. Praziquantel is the current anti-schistosomal drug of choice (Renganathan, 1991). Prompt medical attention with the administration of the drug has yielded positive results. However, the possibility of re-infection after treatment is high because human have no immunity to schistosomiasis. In the past, several control measures have been used (Brown, 1980). Current control measures are now geared toward creating a break in the transmission of infection. Molluscicidal control of snail host and avoidance of water contact with schistosome-infested water bodies are current measures aimed at truncating the route of transmission. Water contact pattern however, has been reported to be very important in preventing the transmission of the infection.

Akogun and Akogun (1996) noted that human water usage behaviour is a major cause of schistosomiasis transmission. As such, non-contact with infested water will prevent transmission of the infection even in endemic areas. Poor housing, water supplies and low educational

level are major factors in schistosomiasis occurrence in endemic area. Some countries, such as Brazil, China, the Philippines and Egypt, have been able to sustain national control programmes for a prolonged period and have succeeded in reducing morbidity to very low levels (Engels and Savioli, 2005). This includes provision of safe water, sanitation and appropriate health education.

The woman plays a very important role in disease control and management. The woman, due to her domestic role, is usually the first point of contact when family members are ill. The woman often decides on appropriate self-treatment before medical attention is sought. Arsenault (2009) noted that women do the bulk of the caring for the sick and therefore are mediators between health professionals and family members. Ukaga et al. (2003) observed that women play major roles in the running of their homes and reiterated the need to integrate women in disease management. The social role of women as health providers within their various families afford them the opportunities of contributing to the control of the spread of disease at household levels. The woman needs to stay healthy and accepted even with hematuria, both for her own sake and for her key role in maintaining healthy families. The state of the woman's health and well-being contributes directly to the health and well-being of their families, especially children and the elderly, and therefore contributes to the community as a whole. Amazigo (1994) and Arsenault (2009) observed that a woman's incapacitation can affect general family health because she will no longer be fit to perform her essential roles. Adequate and correct information on the basics in the biology of the parasite, predisposing factors of infection and the possible risk factors in urinary schistosomiasis will enable the woman take appropriate steps and precautions to protect herself and family from contracting urinary schistosomiasis.

Economic empowerment of women has also been recognized as a tool for effective health care delivery. The low socioeconomic status of most rural women prevents them from making unilateral decisions to seek health care. According to Arsenault (2009), adequate use of health services is intertwined with gender inequality. The woman therefore needs to be empowered educationally and economically to be able to meet with the challenges of her domestic role.

CONCLUSION

Schistosomiasis is an important public health problem and hematuria is one of the symptoms of urinary schistosomiasis. Schistosomiasis is a treatable disease and prompt treatment will go a long way in reducing the spread of the infection. Also, public awareness by stakeholders in disease control is necessary. Frequent campaigns on prevention and control and on general information on the symptoms and route of transmission of

schistosomiasis, especially in endemic areas, are encouraged. A break in the route of transmission is an important way of truncating the spread of infection. This has to do with the avoidance of water contact especially with schistosome-infested streams. A well-designed awareness campaign on health education should be accompanied by an improvement in the woman's capacity to cope with the economic costs of urinary schistosomiasis. Rural communities with erroneous beliefs on hematuria should endeavour to get informed and educated. The woman's domestic roles of protecting herself and her family from contracting infection should not be undermined in the control of schistosomiasis.

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Full Length Research Paper

Social determinants of health: Conceptual and operational predicaments

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Health is determined by many factors ranging from one's immediate physical-psycho-socio environment to the political milieu of the society that an individual lives in. When we look through the biomedical paradigm of health, disease could be explained through a set of micro-level physiological, bio-chemical and pathological changes in the body which are triggered by internal or external environment. When we broaden the horizon and contextualize health through social medicine paradigm, the whole gamut of constellation of macro level determinants also known as social determinants of health come to the fore. The Social determinants are generally outside the realm of individual control for example, the politics, policies, International agreements like General Agreement on Tariffs and Trade (GATTs), Trade-Related Aspects of Intellectual Property Rights (TRIPS), KYOTO protocol etc affect health so also national upheavals like civil wars, communalism, fundamentalism within the country, all of which effect health. This paper tries to drive home the point that while all determinants of health have their own importance, however it is important that we prioritize determinants as actionable and explanatory determinants. Actionable determinants are those predictors of health that easily lend themselves to direct action. Explanatory determinants are factors or philosophies or models that help us in further understanding health as theoretical construct. Innovative efforts need to be made to convert more and more explanatory health determinants into the ambit of actionable health determinants to evolve innovative interventions to demonstrate that action on social determinants of health is feasible.

Key words: Social determinants, causation, risk factor.

INTRODUCTION

Understanding determinants the health broadly serves two purposes, firstly to identify variables that can be acted upon to modify the factor so as to either eliminate or reduce its impact on the health. Second purpose is it helps in deepening our scholastic understanding of the health within the web of interdependent network of factors that influence one another either serially or in parallel to have direct or indirect bearing on health.

Different health professionals concentrate their attention and work at different levels of health determinants. While Clinicians concentrate on the micro level determinants, public health professionals expand it to a much larger array determinant that come into play while dealing with the disease at community level. Social medicine and Community health activism has helped further the expansion and extension of health

determinants into all inclusive developmental models. This expanded understanding encompasses more wider expanse of Political, social and economic domain, emphasizing on the fact that health is not only a benefit of development, but also indispensable to development (Commission on Macroeconomics and Health, 2001).

The search for causes is an important enquiry in health and so also understanding the determinants of health. The more we look for the determinants, the more exhaustive it turns out to be. When we undertake a root cause analysis of health, we start finding the causes/determinants of health. This exercise can be carried on to any length and depth, even to infinity (theoretical possibility) because the more layers we uncover, the more causes and determinants we "discover". Broadly speaking there are two types of

causes:

1. Proximal causes: they are the causal or/risk factor (which have direct causal association with the given health problem).
2. Distal causes: they can be otherwise termed social determinants of health (SDH), which have indirect relationship with given health problem. While SDH in themselves may not have capacity to cause the health problem, they very often are found to be covariant with the proximal causes that is, any variations in distal causes (SDH) in turn causes variations in proximal causes which in turn have direct effect on health. To borrow Geoffrey Rose's term, we need to examine these causes (Rose, 1992).

The social determinants of health are the conditions in which people are born, grow, live, work and age, including the health system. These circumstances are shaped by the distribution of money, power and resources at global, national and local levels, which are themselves influenced by policy choices. The social determinants of health are largely responsible for health inequities; the unfair and avoidable differences in health status seen within and responding to increasing concern about these persisting and widening inequities (Social determinants of Health, Available at http://www.who.int/social_determinants/en/).

In 2005, World Health Organization (WHO) established the Commission on Social Determinants of Health (CSDH), on the premise that action on SDH is the fairest and most effective way to improve health for all people and reduce health inequalities. Central to the Commission's remit is the promotion of health equity which is defined in the literature as "the absence of disparities in health (and in its key social determinants) that are systematically associated with social advantage/disadvantage" (Labonté and Schrecker, 2007). This special commission on SDH warranted as the greatest share of health problems is attributable to the social conditions in which people live and work, and is referred to as the social determinants of health (SDH) (Irwin et al., 2006).

SOCIAL DETERMINANTS OF HEALTH (SDH): THE PUBLIC HEALTH PRACTITIONER'S DILEMMAS

As a public health manager or administrator, one is expected to undertake specific control and preventive measure and show specific health impact. Most of the disease control programmes have internationally agreed with health goals that are mandatorily accompanied with predetermined definite monitoring and evaluating indicators. The progress and the performance of public health manager or performance in health by a given country is assessed based on achieving those

predetermined targets. Examples of achieving such targets in the fixed time frames can be witnessed in disease control programmes for Tuberculosis (TB), Acquired immune deficiency syndrome (AIDS) control programmes. The same is even extended to internationally agreed Millennium Development Goals (MDGs). Unfortunately, all the indicators are directed either on the proximal causes or on the programmatic/operational indicators, all of which have direct association with a given health problem. All the activities undertaken in implementation of health programmes are expected to have a definable and measurable impact on the health outcomes.

However, SDH in contrast poses major challenge to the public health practitioners. While the pivotal role played by SDH in the dynamics of health and well being is indisputable, its translation into programmatic framework for specific time bound action and outcomes are a real challenge. The SDH certainly throws open an exciting array of possibilities and definitely help in further understanding the epistemology of health which are of scholarly interest. However, at the same time, ever expanding list of determinant of health baffles the health programme manager. A programme manager in health is hardly interested in academic understanding of a concept and rather looks for actionable information and solutions. However in spite of its complexities, SDH cannot be ignored.

Social determinants of health (SDH) need to be addressed earnestly for the following reasons

1. Good medical care is vital but unless the root social causes that undermine people's health are addressed, the opportunity for well being will not be achieved;
2. Social conditions powerfully influence both the onset and response to treatment of the major infectious diseases that kill (Michael, 2005);
- 3 Recent reviews by Bates et al. (2004a, b) of research on HIV/AIDS, tuberculosis and malaria, communicable diseases that together account for almost six million deaths per year, identify poverty, gender inequality, development policy and health sector 'reforms' that involve user fees and reduced access to care as contributors to ill health (Labonté and Schrecker, 2007);
4. Last but not the least, the major causes of mortality; cancer and cardiovascular diseases, will not be solved through medical interventions. Medical institutions take care of individuals with these conditions and improve their quality of life but they do not resolve these (or most other) chronic problems. Disease prevention and health promotion programs primarily based on behavioral and lifestyle interventions are also insufficient.

There is plenty of evidence that programs aimed at changing individual behavior have limited effectiveness. Instead, there is need to broaden health strategies to

include political, economic, social, and cultural interventions that touch on the social (as distinct from the individual) determinants of health. These interventions should have the empowerment of people as their first objective. Thus, a national health policy should focus on the structural determinants of health and should have as its primary components political, economic, social, and cultural health policy interventions, focusing on (a) public policy to encourage participation and influence in society, (b) economic and social determinants, (c) cultural determinants, (d) working life interventions, (e) environmental and consumer protection interventions, (f) secure and favorable conditions during childhood and adolescence and during retirement, and (g) health care interventions that promote health (Vicente, 2009).

Root cause analysis of health: Conceptual depth versus operational feasibility

The search for causes of health problems for its remedial action in itself has been one of the primary pre-occupation of health care workers right from the beginning of history of medicine. This excavation and exploration of root cause analysis takes us through various layers of a very broad spectrum of causes and determinants. The determinants identified thus have varied practical utility and interest to diverse range of health care workers from the point of view of taking action. The search takes us through various layers.

First layer: Physician/health manager's delight

When one starts digging for finding causes of any given health problem, one comes across various layers. It will be a very rewarding experience at the first layer, since it digs out the most proximal causes of the given health problem for example, bacteria, nutrition deficiency. This layer is health manager/treating physicians delight because he gets introduced to immediate causes that are responsible for the health problem where he can intervene in them and fix the problem. Results are there to be seen.

Second layer: Health researcher's delight

If the root cause analysis is taken to the second layer, one finds second set of causes, this is the layer of public health researcher's (with biomedical paradigm) delight. In this layer, additional set of proximal causes are unearthed which were not previously known but they are all verifiable by a set of valid experiments for example, housing, sanitation, hygiene, safe water supply, waste disposal, occupation etc.

Third layer: Community health physician's delight

This occurs when the root cause analysis is carried out to the third layer. This is the layer where distal causes start. In this layer, we unearth the social determinants of health-political, social, economic, cultural effects etc. This layer is community physician's delight (with social medicine paradigm). In this layer, happenings in the health can be explained by the political, social, economic, and environmental factors. The relationship between these determinants and the health problems are intuitively understood and to a great extent demonstrable by showing comparisons across regions adopting ecological study approaches for example, health inequalities to social, gender, economic status etc. Generally in Health field, majority of the health professionals are comfortable only venturing up to the third layer because one can intuitively understand the causal relationship between health and its proximal and distal causes. Most importantly, they are comfortable in the first three layers because they can do something practical at individual level to alleviate the suffering of people in various capacities as demonstrated in the first layer (as physician/health manager), in second layer (as health researcher) and in third layer (as community physician/health activist).

Fourth layer: Health philosopher's delight

Now if one digs further into finding root cause analysis, one reaches the fourth layer. This layer is a health philosophers' delight because in this layer, health is contextualized in larger political economy and ideology. To tread through this layer, it is imperative that one needs to have domain knowledge that lay outside the ambit of health. Health determinants derived from this layer are generally beyond one's easy or unassisted comprehension because to make sense of determinants of health unearthed in this layer, one has to piggy back on certain political philosophy or ideology for example, socialism, communism, capitalism and liberalism. One is forced to choose between left, right or centre ideologies from the political spectrum.

At this point, any one has to make a choice either to embrace the new domain's political philosophy/ideology or continue exploration without which one will not understand the connection between the determinants in the fourth layer and Health. The politico-ideological language in which broader health determinants are being discussed in this layer are beyond comprehension of one's uninitiated mind which has not been exposed to any political philosophy or ideology. One would invariably be confused, as the language spoken is different, the paradigm itself is very different. In this layer one needs to understand communist or socialistic ideology to understand their analysis of determinants of health. In summary, as the cliché goes, be a Roman when in Rome

that is, understand leftist ideology first to understand their analysis of determinants of health in the fourth layer.

For example complex theoretical and conceptual framework have been developed specifically for analyzing different pathways by Diderichsen et al. (2001) to theorize impact of globalization on health by identifying "four main mechanisms; social stratification, differential exposure, differential susceptibility and differential consequences that play a role in generating health inequities. "Global is said to affect health outcomes by way of each of these mechanisms and the authors' reference to the influence on stratification of "those central engines in society that generate and distribute power, wealth and risks" (Labonté and Schrecker, 2007).

Incidentally, the determinants encountered in the fourth layer also happen to be the most debated and controversial as they stem out inherently from political analysis. There is a great deal of dogmatic dispute about the rights and wrongs of economic and social policies. People use labels; globalization, neoliberal economic policies as badges of allegiance and terms of use and abuse. This fluidity and variability is expected as the linkage between determinants, and health is extremely difficult by the conventional research methods (Michael, 2005).

IS THERE A BOUNDARY BETWEEN HEALTH AND POLITICS?

SDH inherently being political in nature becomes imperative to look at health through broader perspective of political philosophy, ideology and epistemology. When health is explored in the context of SDH, the boundary lines between health and politics appear to be blurred or altogether non-existent because one is already understood to have embraced certain political philosophy/ideology. One is seen to have begun the journey onto the new path piggy back on one's chosen political philosophy and ideology. At this stage, one invariably appears to have drifted subconsciously into an entirely new domain where one is trying to redefine the entire concept of health from one's new found political philosophical/ideology of the domain one has chosen. That is probably one of the reasons that can explain difference of opinion and lack of consensus between health determinants debate carried out from different philosophical and ideological perspectives. The differences are bound to be there as the paradigms and frame work of analysis are very different from each other.

For this very reason, most of the health professionals find it uncomfortable to go beyond third level of root cause analysis of health. It is understandable as their rigid biomedical paradigm based training has hardly exposed them to broader understanding of health and they find themselves bewildered in dealing with larger global social determinants of Health. They are happy at first level because it gives them actionable causes. They

are happy at the second level as it gives them more research and insight into something doable. With these two levels they are happy for their ability to take action and give relief to the suffering individual/community. They are willing to venture deep into third layer, as it is here that they gain knowledge of determinants of health due to politics, economics and cultural practices that affect health. However, they are less happy here because there is not much that can be done about those global determinants directly but still, it some action option is open in terms of donning a community health activist role and start fighting for suffering community, hence there appears to be a scope for direct action again.

There also appears conscious decision of few not to enter the fourth layer because it does not give them any tangible tool in hand to help directly address the health problem at hand. It may only help them to analyze and contextualize the problem into their respective political understanding, however they may not help them offer any remedy to mitigate the problem. Many dimensions and manifestations of globalization that are not at first glance economic in nature are nevertheless best explained with reference to their connections to the global marketplace and to the interests of particular powerful actors in that marketplace. For example, the globalization of culture is inseparable from, and in many instances driven by the emergence of a network of transnational mass media corporations that dominate not only distribution but also content provision through the allied sports, cultural and consumer product industries (Labonté and Schrecker, 2007).

The other major challenge faced in such global analysis is that it is very dialectic deteriorations in health status or increases in health disparities. This argument is implicit in a widely cited article claiming that "Globalization is good for your health, mostly" (Feachem, 2001) and was stated explicitly by a team of World Bank economists with respect to the transition economies of the former Soviet bloc (Adeyi et al., 1997). However, the empirical uncertainties associated with this position lead Angus Deaton, one of the leading researchers on the relationship between economic growth and health, to warn flatly that "economic growth by itself will not be enough to improve population health (Labonté and Schrecker, 2007) and is not verifiable empirically. A choice made about the approach to improving SDH is the one that will maximize economic growth in the countries or regions of concern, even at the cost of substantial short-term setbacks.

Classification of health determinants: The pragmatic approach for prioritization

While all determinants of health have their own importance, it would be helpful to prioritize determinants as "Actionable determinants" on their ability to lend themselves to direct action and "Explanatory

determinants”, those determinants that help further scholastic understanding of health as theoretical constructs. Such differentiation would help us to understand nuances of health through well founded theoretical base which in turn is rooted into solid academic understanding. The explanatory approach adopted is congruent with recent reviews of research on HIV/AIDS, tuberculosis and malaria (Bates et al., 2004a, b) which concluded that vulnerability to all the three diseases are closely linked; that poverty, gender inequality, development policy and health sector 'reforms' that involve user fees and reduced access to care are important determinants of vulnerability and that "complicated interactions between these factors, many of which lie outside the health sector, make unraveling of their individual roles and therefore appropriate targeting of interventions difficult" (Labonté and Schrecker, 2007).

Although there have been some attempts to take action on SDH, a review of policies in European countries identified several that took action on the social determinants of health (Crombie et al., 2004). However, these actions by their very nature turn out to be generic to ascertain any direct health impact as shown in the review, although the reason for the policies was not necessarily to improve health, however they were nevertheless relevant to health, taxation and tax credits, old-age pensions, sickness or rehabilitation benefits, maternity or child benefits, employment benefits, housing policies, labour markets, communities and care facilities (Michael, 2005).

CONCLUSION

The search for health determinants should be carried on earnestly to gain holistic understanding of health in its broader context. For operational ease, determinants need to broadly be demarcated into “actionable and explanatory determinants”. Innovative efforts need to be made to convert more and more explanatory health determinants into the ambit of actionable health determinants. There is urgent need to evolve innovative interventions to demonstrate that action on social determinants of health is feasible.

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Full Length Research Paper

Sero-epidemiological survey of hepatitis B surface antigenaemia in children and adolescents in Ekiti State, Nigeria

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This study was carried out between October, 2010 and February, 2011 to determine the prevalence of hepatitis B surface antigen (HBsAg) among 1,000 children and adolescents in Ado-Ekiti and Ido-Ekiti, Ekiti State, Nigeria. Serum samples were collected from the subjects and screened for antibodies to HBsAg, using hepatitis B kits with double sandwich antibody principles. Also, standardized questionnaire was used to collect data from the subjects. The results were recorded as positive or negative to HBsAg and were subjected to statistical analysis using a statistical package, SPSS windows version 17 and a *p* value of less than 0.05 was considered significant. Out of the 1,000 subjects enrolled in this study, 529 (52.9%) were males and 471 (47.1%) were females, aged between 9 and 20 years. HBsAg was detected in 115 (11.5%) subjects comprising 74 (14.0%) males and 41(8.7%) females. Prevalence rate was highest in age range 13 to 16 years (50.4%) and was lowest in age range 9 to 12 years (13.0%). Out of the 65 subjects who had previous history of blood transfusion, 7 (6.1%) were seropositive. A total of 21 (18.3%) subjects out of the 201 subjects recorded as having shared sharp instruments and personal materials were positive for HBsAg. Also, 26 (22.6%) out of the 71 subjects who have had sexual intercourse were seropositive. The high risk behaviors associated with Hepatitis B virus (HBV) transmission in this population were; sharing of sharp instruments or personal materials (18.3%) and sexual contact (22.6%). There was no significant difference ($P < 0.05$) between the age, gender and location of the subjects and the prevalence of HBV. It was observed in this study that 115 (11.5%) of adolescents studied in Ado-and Ido-Ekiti harbor HBV and are ignorant of the disease caused by this virus. Mass screening, immunization against the virus and public health education to enlighten the public of the virus, and the possible routes of infection are recommended to reduce the spread of the virus. This study may provide invaluable base line information in controlling the spread of HBV infection in the study location and beyond.

Key words: Hepatitis B surface antigen, children and adolescents, sero-prevalence.

INTRODUCTION

Hepatitis B virus (HBV), a DNA virus of the family hepadnaviridae, is the causative agent of hepatitis B infection (Pungpapong et al., 2007). It is 50 to 100 times

more infectious than HIV, and 10 times more infectious than hepatitis C virus (HCV). Approximately 350 million people are infected with HBV worldwide (Kurbanov et al., 2010). Hepatitis B is a highly prevalent disease, with 350 million chronic cases worldwide (Lok and McMahon, 2007). It is however, an endemic disease in Asia and Sub-Saharan Africa, with seropositivity rate ranging from

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Table 1. Pattern of HBV seroprevalence among subjects in subject with their age.

Age groups (years)	Number screened in Ado-Ekiti	Number and HBV% positive in Ado-Ekiti	Number screened in Ido-Ekiti	Number and HBV% positive in Ido-Ekiti
9 - 12	123	5 (4.1)	105	10 (9.5)
13 - 16	222	11 (5.0)	206	47 (22.8)
17 - 20	155	7 (4.5)	189	35 (18.5)
Total	500	23 (4.6)	500	92 (18.4)

15 to 60% in Africa (Alikor and Erhabor, 2007). Nigeria is a holoendemic area for HBV, with carrier rate of 15 to 35% (Bojuwoye, 2007) and an estimated 12% of the total population being chronic carriers of HBsAg (Olumide, 2007).

HBV has been reported to be transmitted via parenteral route, and by transfusion of HBV infected blood and blood products from mother to child, needle stick injury, ear piercing, during tattoo and other tribal ceremonies (scarification), barber's razors, among others (Agbede et al., 2007; Glebe and Urban, 2007; Bell and Nguyen, 2009). Infection was also discovered to be spread by fomites (inanimate objects), sharing of tooth brush, abrasion and sexual contact with infected persons (Otegbayo et al., 2003; Keffe and Marcellin, 2007; Olokoba et al., 2009; Kurbanov et al., 2010).

To the best of our knowledge, there has not been any report on the prevalence of Hepatitis B surface antigen (HBsAg) among adolescents and children in Ekiti State Nigeria. The aim of this study was to determine the effect of demographic and high risk factors such as age, sex, history of blood transfusion, sharing of sharp instruments and personal materials, as well as sexual, contact on the prevalence to HBV infection among adolescents and children in Ekiti State Nigeria.

MATERIALS AND METHODS

Study area

This study was conducted among subjects in Ado-Ekiti and Ido-Ekiti, Ekiti State, representing urban and rural areas of the state, respectively. The study was conducted between October, 2010 and February, 2011.

Study population and sample size determination

The study population consists of one thousand adolescents and children in Ado-Ekiti and Ido-Ekiti. The method of Daniel (1983) was used for the determination of the sample size. This was determined based on the prevalence rate of the study of Pennap et al. (2010). The sample size (N) was estimated using the marginal error of 1.5% and 95% confidence interval.

$$N = \text{Prevalence} \times (100 - \text{Prevalence}) / (\text{Allowable error} / 1.96)^2 \approx 969$$

However for more accurate results, a total of 1,000 samples were

collected from children and adolescent in the study area.

Study design

The aim of the study was explained to the subjects and their parents, and a well structured questionnaire was administered only to the subjects who gave a verbal consent. A structured questionnaire interview was used to collect data. The questionnaire used in the interview was evaluated, reviewed carefully, and then pre-tested on 20 respondents, and it consisted of two parts: the first focused on socio-demographic characteristics of respondents such as age, sex, age and location. The second involved factors predisposed to hepatitis B.

Collection of serum samples

Two millilitre of blood was aseptically collected by vein puncture into appropriately labeled bottles. The blood samples were allowed to clot and centrifuged for five minutes at 2,000 rpm in order to separate the serum from the clotted blood. The serum was then collected aseptically into another labeled bottle using an automated pipette. Serum that was not tested immediately was stored in the refrigerator until tested.

Serological detection of hepatitis B surface antigen (HBsAg)

The HBsAg One step hepatitis B surface antigen test strip (Gold Medical Diagnostics Reagent, USA), a rapid chromatographic immunoassay for the qualitative detection of Hepatitis B surface antigen in serum/plasma, was used for screening the participants. It utilizes a combination of monoclonal and polyclonal antibodies to selectively detect elevated levels of HBsAg in serum/plasma. The test was carried out and interpreted according to the manufacturer's instructions.

Data analysis

The data generated from this study were analyzed for level of significance using chi-square using SPSS (version 17). The level of significant was determined at p-value of $p = 0.05$ in all the statistical comparisons.

RESULTS

The total number of subjects enrolled in this study was 1,000: 500 from Ado-Ekiti and another 500 from Ido-Ekiti. Their age ranged from 9 to 20. The male to female ratio was 1:1.2 for Ado-Ekiti and 1.5:1 for Ido-Ekiti. Table 1

Table 2. Pattern of HBV seroprevalence among subjects in respect to their sex.

Number of subject	Location	Sex		
		Male	Female	Total
Number tested	Ado	232	268	500
	Ido	297	203	500
	Total	529	471	1000
Number positive	Ado	13	10	23
	Ido	61	31	92
	Total	74	41	115
Seropositivity (%)	Ado	5.6	3.7	4.6
	Ido	20.5	15.3	18.4
	Total	14.0	8.7	11.5

Table 3. Seropositivity pattern of HbV and exposure to risk factors.

Number of subject	Location	Predisposing factor		
		Blood transfusion	Sharing of sharp objects	Sexual intercourse
Number tested	Ado	15	103	20
	Ido	50	98	51
	Total	65	201	71
Number positive	Ado	3	9	7
	Ido	4	12	19
	Total	7	21	26
Seropositivity (%)	Ado	4.6	8.7	35.0
	Ido	6.2	4.5	37.3
	Total	10.8	6.0	36.6

shows the results from the risk factors for hepatitis B surface antigen seropositivity among the subjects. The prevalence was higher among subjects with age range between 13 and 16 (13.6%) while the least prevalence was recorded among subject between 9 and 12 (6.6%).

In Ado-Ekiti, Hepatitis B surface antigen (HBsAg) was detected in 23 (4.6%) subjects comprising 13 (5.6%) males and 10 (3.7%) females. A total of 92 (18.4%) subjects comprising 61 (20.5%) males and 31 (15.3%) females were positive for HBsAg in Ido-Ekiti, as shown in Table 2. Prevalence rate was high in age group 13 to 16 years which was 11 (5.0%) and 47 (22.8%) in Ado-Ekiti and Ido-Ekiti, respectively. In both locations, the incidence was lower among subjects aged from 9 to 12 years with 4.1 and 9.5% in Ado-Ekiti and Ido-Ekiti, respectively. As shown in Table 3, out of 15 subjects that had histories of blood transfusion in Ado-Ekiti, 3 (4.6%) were positive for HBsAg. In Ido-Ekiti, 4 (6.2%) out of the 50 subjects that had been blood transfused were seropositive. In Ado-Ekiti, there were recorded 9 (4.5%)

seropositive subjects out of the 103 subjects that shared sharp instruments and personal materials, while Ido-Ekiti had 98 subjects who shared sharp objects having a prevalence rate of 6.0% ($n = 12$). The rate was lower in Ado-Ekiti 4.5% ($n = 9$). Also in Ado-Ekiti, 7 (35.0%) out of the 20 subjects that admitted to having had sexual intercourse were positive for HBsAg while 19 (20.7%) of the subjects in Ido-Ekiti were seropositive. There was no significant difference ($P < 0.05$) between age, gender and location of the children and the occurrence of hepatitis B virus.

DISCUSSION

This study shows that children and adolescents can contract hepatitis B as reported by Ladapo et al. (2011). The seroprevalence rate of HBV infection among the subjects in Ado-Ekiti was 4.6% while that of subjects in Ido-Ekiti was 18.4% as shown in Table 1. These values

were lower than the 21.3% reported in Ibadan, Oyo State by Otegbayo et al. (2003). Hence, Ado-Ekiti is moderately endemic to HBV infection. Also, according to Bojuwoye (2007), Nigeria is a holendemic area for HBV with carrier rate of 15 to 37%. Ido-Ekiti, a typical rural area, was highly endemic for HBV infection compared to Ado-Ekiti, an urban area. This is in agreement with the report of Oje (2011).

The overall HBV prevalence rate of 11.5% recorded in this study was higher than the 7.6% reported in primary school children in Newi, Nigeria. The incidence at early stage of life showed that HBV can be contracted in early childhood as stated by Alter (2003). The prevalence rate was higher in the rural area (Ido-Ekiti) than urban area (Ado-Ekiti). This may be due to lack of information and poor personal hygiene. The prevalence rate of 18.4% recorded in Ido-Ekiti is higher than the 12.4% reported by Alikor and Erhabor (2007) in children attending tertiary health institution in Niger Delta region of Nigeria, and the lowest prevalence was observed in children within 9 and 20 years while it was highest among subject within the 13 and 16 years age group. This observation supports the findings of Zaki et al. (2003) that prevalence of hepatitis B virus infection increases with increasing age of children.

There was no significant difference ($P < 0.05$) between the age, gender and location of the children and the occurrence of HBV. This is contrary to the findings of Odusanya et al. (2005) that reported higher in males than females. Considering the risk factors associated with HBV infection in both locations, it seems that sharing of sharp instruments or personal materials (10.4%) and of sexual intercourse (36.6%) were the major risk factors for HBV transmission in this population as shown in Table 3. This finding is in agreement with the scientific report that unsafe use of sharp instruments and sexual contact are important routes of HBV transmission (Agbede et al., 2007; Keffe and Marcellin, 2007; Kurbanov et al., 2010). History of blood transfusion had the lowest seropositivity (10.8%). This confirms the findings by Redd et al. (2007) that HBV is no longer transmitted by blood transfusion because all blood for transfusion is screened to exclude contamination with HBV.

Conclusion

Hepatitis B surface antigen was determined in 1,000 secondary school children in Ado-Ekiti and Ido-Ekiti, Ekiti State, Nigeria with 115 (11.5%) subjects seropositive. Ado-Ekiti and Ido-Ekiti were both, respectively, moderately and highly endemic for HBV infection. There was no significant difference ($p < 0.05$) with respect to age, gender and location. Adolescents in the studied area harbour asymptomatic HBV and are ignorant of the disease caused by this virus. We recommend that governmental and non-governmental organizations should assist in the area of mass screening, mass

immunization against the virus and public health education to enlighten the public of the danger of the virus and the possible routes of infection.

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Full Length Research Paper

Validation of percent body fat using skinfold-thickness, bioelectrical impedance analysis and standard hydrostatic method in male wrestlers

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The aim of this present study was to determine and validate the percent body fat through skinfold-thickness and bioelectrical impedance analysis (BIA) using hydrostatic (standard method) among male wrestlers in Ahvaz city. To do so, 25 male wrestlers were selected randomly (N = 60). Statistical analysis was done using Pearson correlation coefficient, paired T-test, standard error estimation (SEE) and total error (TE). The statistical analysis shows that the skinfold-thickness method used by Lohman for wrestlers has a significant difference with hydrostatic method (standard method). Also, there was no significant difference between wrestlers in terms of bioelectrical impedance and standard method results (TE = 0.0078, SEE = 0.0071, R = 0.871, P = 0.297). Findings suggest that using BIA is a more suitable method to measure wrestlers' percent body fat.

Key words: Percent body fat, skinfold-thickness, bioelectrical impedance, hydrostatic.

INTRODUCTION

Finding the ratio of fat-free mass (FFM) to fat mass (FM) in athletes is very important; so that the little changes in body composition determines health and performance of the athletes (Houtkooper and Going, 1994). And in some competitions like wrestling and weight lifting, an appropriate body composition influences the competition result (Heyward and Stolarczyk, 1996). Especially, those who are involved in weight measuring for their sports category (like wrestling), weight of the body should be observed and it needs a regular program. There are several methods for determining the body composition of different groups, which differ in terms of cost, time period, and measurement problems (Claros et al., 2005). Amongst many methods to measure body composition, the underwater weighing method is known as a standard method (Katch, 1969). Air-displacement plethysmography and dual-energy X-ray absorptiometry (DXA) are two new reference techniques (Dempster and Aitkens, 1995; Salamone et al, 2000). However, these techniques have

some limitations, like the unavailability or expensiveness of the equipment for measurement. Therefore, the simpler techniques like bioelectrical impedance analysis (BIA) and skinfold-thickness are used and they are still useful in field studies (Mírza et al., 2004). Underwater weighing is a gold standard technique for researchers, athletes and physicians, but it has some limitations such as being time-consuming (it takes 30 to 60 min), subjects should stay for a long time under the water and it also requires us to measure the remaining volume of the lung (Lippincott and Williams, 2005). Skinfold-thickness is a field technique which requires a long and careful fat measurement using the caliper and the skillfulness of the investigator will influence the result; thus, this technique requires the investigator to undergo some special training before conducting the test (Jackson and Pollock, 1985). Skinfold-thickness limitations has led researchers to go after some other techniques like BIA which is less time consuming, easier for investigator to conduct it, does not need to train the investigator and is non-invasive (Cable et al., 2003). Willa et al., (1999) in her study on reliability and validity of body composition measures in female athlete students of Michigan State

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University showed that bioelectrical impedance has the most reliability and validity than other techniques. Craig et al. (1998) in "Bias and limits of agreement between hydro densitometry, bioelectrical impedance and skinfold calipers measures of percentage body fat" found that there are some differences between the standard technique and both the field techniques; however, they suggested that by meeting some criteria, these techniques could be used for athletes. Coolville et al. (1989) have compared methods for estimation of body fat in body builders. They tested Jackson-Pollock's seven-point subcutaneous fat and bioelectrical impedance on 21 athletes (including 9 men and 12 women) and then these two methods were compared to underwater weighing. Results suggest that there is a weak correlation between bioelectrical impedance and underwater weighing methods ($R = 0.36$), but the Jackson-Pollock's seven-point subcutaneous fat method has a relatively good correlation with under water weighing ($R = 0.84$). This study suggested that instead of underwater weighing method we can use Jackson-Pollock's seven-point subcutaneous fat method. Researchers use different methods to estimate percentage of body fat in athletes and still there is no established method for that, which in turn makes researchers confused. The most important aim of the present study is to determine the percentage of body fat using skinfold-thickness, BIA and underwater weighing (hydrostatic) methods, in male wrestlers. The second important matter is to figure out, whether there is a difference between skinfold- thickness and bioelectrical analysis on one hand and underwater weighing method on the other, in terms of percentage of body fat for male wrestlers. And considering the fact that skinfold-thickness and bioelectrical impedance methods are less expensive and more available and also the limitation of hydrostatic method in terms of cost, time consumption and location, therefore, what is the best and most suitable method(s) for determining the percentage of body fat in male wrestlers? The aim of the present study is to determine the percent body fat through skinfold-thickness, BIA using hydrostatic (standard method) among male wrestlers in Ahvaz.

METHODOLOGY

The population for statistics in the present study was all male wrestlers (60 persons). Out of these subjects who have been selected via a questionnaire, we selected randomly, 25 wrestlers from active clubs (Folad and corporation oil) in Iran. Because the total wrestlers were unavailable, the participant had at least 4 years of professional experience in wrestling. The participant's background exercises were included at least 2 h per day, 6 days exercise per week and they were in fitness period for competitions.

Measuring devices

The measuring devices were Harpenden caliper for measuring the skinfold-thickness, Seca medical scale (Germany) for weighing the

subjects, stand height measuring device (Digital vertical jumping tester, Japon), bioelectrical impedance device (Olympia 3.3, Jawon of Core), Digital hydrostatic scale (Rengit, Poya electric of Iran) and pool in dimension $1.2 \times 1.2 \times 1.5 \text{ m}^2$, Spirometer for estimate of the remained volume of lung (Ganshorn, Germany). All the subjects took all the tests [hydrostatic weighing (HW), BIA and SKF] in a single day and 12 h prior to the test, the subjects were asked to neither have any food nor do any exercise. For young male wrestlers (18 to 26), we used the skinfold-thickness method through Lohman three-point equation (Lohman, 1982) as follows:

$$Y = (\text{Abdominal} + \text{sub-scapular} + \text{triceps}) \text{ BD} = 1.0982 - 0.000815 (Y) + 0.00000084 (Z)^2$$

and the remaining volume of the lung was measured by Spirometer. BIA was measured using Body composition analysis device (Olympia 3.3); and to convert it into percent body fat, we used Siri equation (Siri, 1956).

$$\%BF = [4.95 / \text{BD} - 4.5] \times 100$$

Measuring subcutaneous fat using a caliper

Skin thickness includes epidermis and dermis layers. Skinfold measurement was done using Harpenden skinfold caliper under a pressure of 10 gm/mm^2 . In order to consider validation criteria, we did all measurements on the right side of the body, using Lohman's method (1982). After marking the desired spot, we take the caliper in our right hand and then we can measure thickness of the subcutaneous fat by pinching the fat.

Measuring body fat using bioelectrical impedance

We asked participants to stand on the foot plates of the device with command of the tester. Then we asked them to hold the handhold and keep it beside their body with an angle of 30° . Then they were supposed to squeeze the handholds for 10 s. After some seconds, the details of their body compositions were displayed on the monitor.

Measuring body fat using hydrostatic weighing

Required equipments to measure the body density includes a specialized tank of water with dimensions of $1.2 \times 1.2 \times 1.5 \text{ m}$, a seat out of polyvinyl chloride (PVC) which is hanging from the ceiling and it is connected to a digital hydrostatic scale. Before testing, we measured the $^\circ\text{C}$ water temperature and controlled its temperature in an appropriate level (30 to 34). All participants were asked not to eat any food (except for drinking water) 12 h prior to the test and refrain from every sporting activity. After observing the stated criteria, we explained to participants how to perform HW and the potential risks especially when exhaling inside the water tank; then we asked them to enter the water tank gently and sit on the seat. In the following stage of the test, they were asked to inhale deeply for 4 to 5 times and then take a complete and slow exhale, in such a way that 90% of exhale is outside the water and the remaining 10% is followed by submerging the head in water. Then in these conditions, they stayed submerged for 4 to 5 s in the water and the tester recorded the figures displayed on digital scale up to three decimal places. We repeated this process for 5 times for each participant. Eventually, we measured mean of two lower amounts in order to determine the hydrostatic weight.

RESULTS

Tables 1 and 2 show statistical findings related to the

Table 1. Descriptive findings about wrestlers.

Statistics variable	Mean (SD)	Maximum value	Minimum value
Age (year)	22.20 ± 2.58	26	18
Height (cm)	172.24 ± 6.92	192	160
Weight (kg)	68.37 ± 7.55	83	55
BMI (kg/m ²)	24.63 ± 4.06	33.54	18.59

Table 2. Results of Pearson correlation coefficient test between variables through Lohman three-point equation.

Variable statistics	R	R ²	TE	SEE	t	P-value	M ± SD	Range
%BF - HW % bf	0 / 821	0 / 756	3 / 87	2 / 64	-5 / 42	0 / 001	16.45 ± 8.75	9.56 - 22.15
BD - HW bd	0 / 871	0 / 780	0 / 0078	0 / 0071	-5 / 71	0 / 001	1.0671 ± 0.0127	1.0512 - 1.0790
BIA - HW % bf	0 / 736	0 / 722	2 / 61	2 / 03	1 / 81	0 / 297	14.65 ± 6.01	8.74 - 21.01
HW % bf							14.04 ± 6.07	7.3 - 20.8
HW bd							1.0640 ± 0.002	1.0451 - 1.0681

TE, Total error; SEE, standard error; BD, body density.

body density and fat percentage tests. Internal reliability of groups in the first and second phases tests showed that the correlation was $R = 0.87$ to 1.0 and the errors were negligible and the tolerance for all tests was normal.

External reliability of groups in terms of percent body fat in first and second phases of the test showed a correlation of $R = 0.88$ to 1.0 and the negligible errors confirm the reliability and accuracy of the test. We found the following results:

- 1) There is a difference between Lohman equation and standard method, in terms of measuring the body density for male wrestlers (Table 2) ($P = 0.001$). The mean value of subcutaneous fat was measured by Lohman three-point equation and standard method (16.45 and 14.04, respectively). These two means have a significant difference ($P = 0.001$).
- 2) There is correlation between Lohman equation and standard method in terms of measuring body density of male wrestlers (Table 2) [$R^2 = 0.780$, $R = 0.871$, standard error estimation (SEE) = 0.0071, total error (TE) = 0.0078]. Also, there is a significant correlation between Lohman three-point equation and standard method in terms of percent body fat ($R^2 = 0.756$, $R = 0.821$, SEE = 2.64, TE = 3.87).
- 3) There was no difference between bioelectrical impedance and standard method in terms of body density in male wrestlers. In other words, considering Table 2, the percent body fat determined through bioelectrical impedance and standard method are the same; that is, there is no significant difference between the two methods ($P = 0.297$).
- 4) There was a significant correlation between bioelectrical impedance and standard method in terms

of body density in male wrestlers (TE = 2.61, SEE = 2.03, $R = 0.0763$, $R^2 = 0.0722$) (Table 2).

DISCUSSION

The average density of body was 1.0671 g/ml according to Lohman's three-point equation and the same value determined by standard method was 1.0640 g/ml (Table 2) for male wrestlers. These two averages have a significant difference.

This means that the determined density of body through Lohman's three-point equation (BD) is more than the value determined by standard method (HW).

Also, the average subcutaneous fat determined by Lohman's three-point equation was 16.45% and 14.04% in standard method. These two averages have a significant difference.

This result corresponds with previous results by wellborn (2000) and Guang et al. (2005), and it is not consistent with results of Housh et al. (2004), Andreoli et al. (2006) and DE Lorenzo (2004). The correlation coefficient of body density for wrestlers was $R = 0.871$, using Lohman equation and standard method.

Comparison of this correlation coefficient against the possibility ($P \geq 0.05$) shows that there is a significant correlation between both BD methods and coefficient of determination ($R^2 = 0.780$) shows that there is an appropriate linear relation between the two mentioned methods.

It should be noted that the SEE was 0.0071 g/cc and TE was 0.0078 g/cc. The correlation coefficient of percent body fat using Lohman's three-point equation and standard method for wrestling was $R = 0.821$. With

regard to the level of probability ($P \leq 0.05$) for percent body fat of subjects between Lohman's three-point equation and standard method, there is a significant correlation.

This result is somehow consistent with previous results by Utter et al. (2001), Dixon et al. (2005) and Williams and Bale (1988), but it is not consistent with results by Covington (1990) and Andreoli et al. (2004).

Findings show that there is a significant difference between Lohman's three-point skinfold-thickness method and standard method in terms of average value ($P = 0.001$) and also, there is a very high correlation between them through the standard method which shows the accuracy of these equations; however, we can rely on these equations, for the coefficients used are appropriate for non-Iranian population and they are not suitable for Iranian community.

Jeffrey and Johansson (1995) found out in their study that we cannot use the same equation in every population to measure the subcutaneous fat (Bruzuck et al., 1963). Also, they suggested some special equations by Heyward and Stolarczyk (1996) for different populations (Heyward and Stolarczyk, 1996). Lohman suggests that some errors related to BD predictions might be as the following:

- A) Technical errors are due to the difference between calipers or experience and skill of the examiners.
- B) Biological differences of subjects, including difference in terms of percent body fat, will affect the BD estimation (Lohman, 1992).

The average value of percent body fat was 14.65 through bioelectrical impedance and it was 14.04 through standard method for wrestlers and the existing difference between the two methods is not significant and the results of our study are consistent with results by Williams and Bale (1988), but the results are not consistent with results of Charke (1989), Coolville et al. (1989), Dixon et al. (2005), Huygens (2002), Clark et al. (2004) and de Lorenzo (2004).

Correlation coefficient for percent fat in wrestling, determined by bioelectrical impedance and standard method was $R = 0.763$. With regard to the level of probability ($P \leq 0.05$) for percent body fat of subjects between bioelectrical impedance and standard method, there is a significant correlation.

The resulted coefficient of determination ($R^2 = 0.722$) shows that there is a good linear relation between the two test methods. This result is somehow consistent with results by Dixon et al. (2005), Clark et al. (1994), Charke (1989) and Clark et al. (2004) but it is not consistent with results by Coolville et al. (1989), Andreoli (2004) and Welborn and Knuiiman (2000). Segal (1996) in his evaluation study suggested that bioelectrical impedance in sports and exercise is a method to evaluate the athletes' body composition.

There are several problems in using BIA in sports and exercise and some issues should be taken into consideration for the future studies. There are generally two problems; physiological factors change and the limitation in predicting equations which brings about the statistical problems.

Some physiological factors should be considered when using BIA, to control the conditions of the test; for example, we should consider the amount of body water, body temperature, time of the last exercise, glycogen storage and chemical maturity in young athletes. Accuracy and validity of BIA method will be achieved only when the experimental conditions are controlled exactly (Segal, 1996).

Considering the average value of studied methods and standard method for wrestlers, we have found results that can be significantly different for implication of validated predicting equation in ethnic, genetic and tribal groups. According to this theory, only bioelectrical impedance method had the admissible P-value ($TE = 2.61$, $SEE = 2.03$, $R = 0.763$, $p = 0.297$).

This shows that despite the high correlation between bioelectrical impedance and standard method and in spite of negligible errors (SEE, TE), there is no significant difference between the elite methods, and the bioelectrical impedance method has a higher level of validity and reliability. Thus, we suggest that it can be used for athletes. And Lohman's skinfold-thickness method is not valid and there is a significant difference between several averages of Lohman's three-point method in wrestlers and we should not use it for male wrestlers.

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Full Length Research Paper

Factors associated with female genital mutilation in Burkina Faso

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While the practice of female genital mutilation (FGM) has been abandoned in western countries, it remains common in many African countries from Senegal to Somalia, in the Middle East, in some parts of South-East Asia and even among immigrant communities in Europe, North America and Australia. Previous studies in Burkina Faso reported a high prevalence (77%) of FGM among 15 to 49 years old women and described the commitment of the government of Burkina Faso to end this practice. Little is known about the effect of this effort on the trend of FGM in the country. This study examined whether the prevalence of FGM changed overtime and identified the factors associated with this practice. Data from the 2010 multistage household survey of 15 to 49 years old Burkinabe women were analyzed. Simple frequency and logistic regression were used to meet the study objectives. Of the 3,289 women who participated in the survey, 68.1% had undergone FGM. Among those who had a daughter (n = 2258), 18.7% had a circumcised daughter. Young age [15 to 24 years (odd ratio (OR): 0.26, 95% confidence interval (CI) 0.21 to 0.31) or 25 to 34 years (OR 0.59, 95%CI 0.48 to 0.72)], ethnicity [Gourmatche ethnic group (OR: 0.48, 95%CI 0.31 to 0.73)], religion [Muslim (OR: 1.53, 95%CI 1.09 to 2.14)], and social support from community leaders (OR: 1.37, 95%CI 1.07 to 1.75) were significantly associated with the FGM among women in Burkina Faso. Although, FGM is associated with serious health risks, its prevalence remains unacceptably high in Burkina Faso. Social marketing interventions targeting community social norms, raising the community awareness about FGM, and empowering women to make informed decisions for their daughters are needed in order to end this deeply rooted tradition.

Key words: Female genital mutilation, prevalence, predictors, social norms, Burkina Faso.

INTRODUCTION

An estimated 100 to 140 million women and girls worldwide are currently living with the consequences of female genital mutilation (FGM), including 92 million girls of 10 years and above in Africa (World Health Organization (WHO), 2008). FGM is a partial or total removal of the female external genitalia or other injury to the female genital organs for cultural or other non-therapeutic reasons (WHO, 2008). This ancient ritual can be traced back to ancient Egypt under the Pharaohs. Egyptian mummies were found to have been circumcised as far back as 200 BC (Kouba and Muasher, 1985;

Brady, 1999). While the practice of FGM has been abandoned in Western countries, it remains popular in many African countries (from Senegal to Somalia), in the Middle East, in some parts of South-East Asia and even among immigrant communities in Europe, North America and Australia (WHO, 1997).

Many health risks are associated with FGM, most notably among women who underwent infibulations. Short terms complications include pain, urinary infections, and hemorrhage. In the long term, women who had FGM complain of urinary incontinence, pelvic inflammatory diseases and infertility. Although, FGM can potentially transmit human immunodeficiency virus (HIV) infection, the actual risk remains controversial in the literature (Hrady, 1987; Kun, 1997; Brady, 1999; Monjok et al.,

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2007).

WHO and other United Nations organizations have recently issued a new joint statement and have broadened the FGM classification: Type I, partial or total removal of the clitoris, with or without excision of part or all of prepuce (clitoridectomy); Type II, partial or total removal of the clitoris and the labia minora, with or without excision of the labia majora (excision); Type III, narrowing the vaginal opening through the creation of a covering seal by cutting and repositioning the labia minora and/or the labia majora, and with or without removal of the clitoris (infibulations); and Type IV, all other harmful procedures to the female genitalia for non-medical reasons, such as pricking, piercing, incising, scraping and cauterizing the genital area.

With the increasing recognition of the FGM practice as a violation of the human rights of women and girls, several of the countries that ratified international treaties addressing various forms of discrimination and violence are taking actions to outlaw or criminalize this practice. Based on the results of the 2003 Enquête Démographique et de Santé (EDS), 77% of Burkinabe 15 to 49 years old women had undergone FGM. Burkina Faso is one of the pioneering African states engaged in the fight against FGM. In the past 18 years, it has put in place several institutional and normative measures to sensitize, dissuade and sanction potential or actual perpetrators of FGM (The World of Parliament, 2009).

The purpose of this study is threefolds: (1) to update the prevalence of FGM among Burkinabe women (15 to 49 years old) and their daughters, (2) to examine the reasons why women undergo the operation, and (3) to identify the factors associated with the practice of FGM among Burkinabe women and their daughters. This information will assist the government of Burkina Faso to assess not only the trends of FGM in the country, but also the effect of the effort undertaken in the past 18 years to fight FGM. A better understanding of factors associated with FGM will inform the design of more effective interventions. Finally, keeping the discussion about FGM alive will also encourage donors to consider funding interventions aimed at ending FGM.

Theoretical framework

Population Services International (PSI)'s internal framework for behavior change and health impact, the Performance Framework for Social Marketing (PERForM) (Figure 1), guided this study. The PERForM framework has been described elsewhere (Chapman and Patel, 2004; Kassegne et al., 2011). Briefly, PERForM framework portrays a set of theoretical pathways through which social marketing interventions can potentially influence behaviors that affect health. The framework assumes that people's behaviors are influenced by two broad groups of factors including their socio-demographic characteristics and mutable behavioral determinants. The

PERForM framework identified 16 mutable behavioral determinants drawn from various health behavior theories [Belief Model (Rosenstock, 1974) and the Theory of Reasoned Action (Fishbein and Ajzen, 1975), and marketing theory (Chapman, 2004)]. These factors are grouped into 3 categories as Rothschild (1999) suggested: factors of opportunity (ability, social norms, etc) encompass institutional factors that influence someone to perform a desired behavior; factors of ability (knowledge, social support, self-efficacy) relate to individual's skills or proficiencies to perform the behavior; and factors of motivation (belief, attitude, expected outcome, etc) influence individual's desire to perform the behavior.

Promoting increased risk-reducing behavior and/or greater use of protective products or services through social marketing interventions will likely improve the health status and the quality of life of individuals.

This study focuses on 9 mutable determinants thought to be relevant to FGM practice: social norms, knowledge of health effects of FGM, social support, self-efficacy to oppose FGM, intention to accept FGM, locus of control for FGM, outcome expectation and threat related to FGM.

METHODOLOGY

Sample

With funding from the Kreditanstalt für Wiederaufbau (KfW), PROMACO has been implementing the Program for the Prevention of HIV/AIDS and support for Reproductive Health (PREVISAR) since 2007 in order to contribute to the reduction of the prevalence of HIV/AIDS, female genital mutilation and maternal and infant mortality.

To assess the difference between women who had and those who had not undergone FGM with a confidence level of 95% and a power of 0.80, using an effect size of 1.5 and a 10% non-response rate, a sample size of 3,400 respondents were needed for the study.

To get this sample size, a cross-sectional survey of women of reproductive age was conducted between February and June 2010 using a three-stage sampling approach. The country's enumeration zones list from the 5 districts where the intervention took place (Hauts Bassins, South West, Plateau Central, Center East and East) served as the sampling frame. In the first stage, 103 enumeration zones were selected based on a probability proportional to the size of the district. The most populous districts contributed more enumeration zones. At the second stage, 30 households were randomly selected in each enumeration zone, yielding a total of 3090 households. Finally, all female household members of age 15 to 49 were asked if they would serve as survey participants and those who consented were interviewed. A total of 3,289 women were selected.

Ethical review

All researchers, involved in this study, were trained in courses certified by the Office of Human Resources Protections on the Code of Standards and Ethics for Survey Research. Participants were informed that they were participating in a research, that their participation was voluntary, and that their answers were confidential. Only participants who signed an informed consent

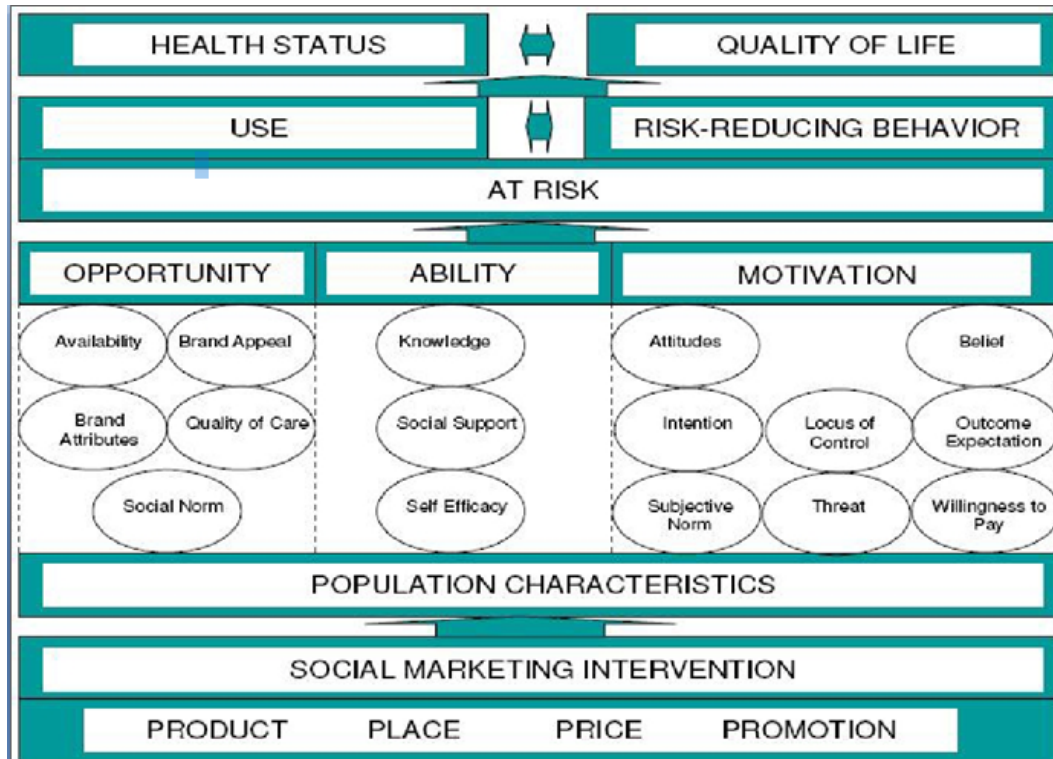


Figure 1. The performance framework for social marketing (PERFoM).

were included in the study. To ensure confidentiality for participants, researchers did not collect identifying information. Information collected was accessible only to members of the research team and was kept in locked file cabinets. The study was approved by the Population Services International Ethical Review Board.

Measure

A pretested interviewer-administered questionnaire collected information on socio-demographic characteristics; knowledge and perceptions of FGM; its complications; sources of information about the practice; the age at which girls undergo the practice; and intention to circumcise their daughter. Information was also collected on household characteristics allowing for the calculation of household socioeconomic status (access to drinking water, toilet facilities, cooking fuel, consumer items (television, bike/car), wall/flooring material). Finally, the questionnaire measured opportunity, ability, and motivation (OAM) determinants of behavior, and exposure to the FGM interventions. A multi-item scale measured the OAM factors. Possible answers ranged from 1 to 4 "1=Strongly Disagree, 2=Disagree, 3=Agree, 4=Strongly Agree". The determinants were reported as percentages of respondents who agreed with the statements. Trained interviewers collected the data under supervision of PROMACO researchers.

Statistical analysis

Women who participated in the survey were asked "Have you been circumcised? Those who had a daughter were asked: "Has your daughter been circumcised?" The answers to these two questions were used to determine the prevalence of FGM among Burkinabe

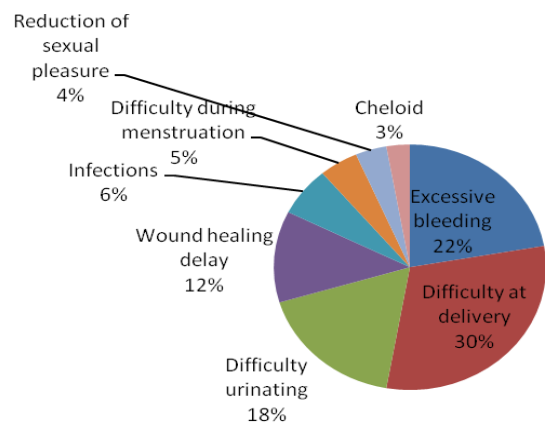
women and their daughters. Women who had and those who had not had FGM in one hand and women with and those without a circumcised daughter on the other hand were compared with regard to sociodemographic characters (Tables 1 and 2). Bivariate analysis was used to assess the difference between the different groups. UNIANOVA test was also used to compare the mean score for OAM between the two groups. Logistic regression was used to compare women who had and those who had not had FGM as well as women with and those without a circumcised daughter. All sociodemographic and behavioral variables were entered into the model, and non-significant items were dropped then re-entered one by one until the Wald statistic was <1.0. The remaining non-significant items were dropped from the model. Only significant items were presented in Tables 3 and 4. Statistical Package for Social Sciences (SPSS) Version 17 was used to analyze the data.

RESULTS

Of the 3,289 Burkinabe women who participated in the survey, 2,240 (68.1%) underwent FGM. Among women who had a daughter ($n = 2,258$), 18.7% had a daughter who underwent FGM. Traditional practitioners performed the vast majority of FGM (82.4%), although medical personnel are timidly making some inroads in this business (0.4%). The median age at which girls underwent FGM was 8 years. Majority of the participants (70.1%) failed to cite a single benefit for undergoing FGM. The few benefits cited included the improvement of the family social status (5.9%), better personal hygiene (5.4%) and increased chances of getting married (3.6%). Figure 2 summarizes the health complications reported

Table 1. Socio-demographics characteristics of Burkinabe women by female genital mutilation.

Characteristic	Women who had had FGM				P-value
	No		Yes		
	N = 1049	31.9%	N = 2240	68.1	
Age of respondents (Years)					
15 - 24	497	46.5	566	53.2	<0.001
25 - 34	343	28.9	843	71.1	
35 - 49	209	20.1	831	79.9	
Religion					
Animist	198	33.3	397	66.7	<0.001
Muslim	532	29.3	1284	70.7	
Christian	319	36.3	559	63.7	
Attended school					
No	769	30	1797	70	<0.001
Yes	280	38.7	1217	69.7	
Socio-economic status					
Low	520	33.7	1023	66.3	0.037
High	529	30.3	1217	69.7	
Region					
Center-east	191	27.1	514	72.9	<0.001
East	255	40.8	370	59.2	
Haut-Bassins	267	40.9	386	59.1	
Plateau Central	95	14.9	544	84.1	
South West	241	36.1	426	63.9	
Ethnic group					
Mossi	368	27	996	73	<0.001
Bissa	108	23.9	344	76.1	
Gourmatche	220	45.2	267	54.8	
Dioula	10	58.8	7	41.2	
Bobo	21	38.9	33	61.1	
Lobi/Birifor	98	36	309	64	
Dagara	50	33.8	99	66.2	
Others	174	34.5	186	65.5	

**Figure 2.** Complications of FGM among Burkinabe women, 2010.

by women of reproductive age who had FGM. Difficulty at delivery (30%), excessive bleeding (22%) and difficulty urinating (18%) were the most commonly cited complications.

Table 1 summarizes the differences among women by their FGM status. Women who had and those who had not undergone FGM differed significantly with regard to most socio-demographic characteristics. A high proportion of FGM was observed among older women of 35 to 49 years old (79.9%), Muslims (70.7%), those who did not attend school (70.0%), women with a high socio-economic status (69.7%), those who lived in the Plateau region or were from the Bissa ethnic group.

Table 2 shows the differences between women with and without a circumcised daughter. The two groups differed in regard to all socio-demographic characteristics

Table 2. Socio-demographics and OAM characteristics of Burbinabe women by Daughters's Female Genital Mutilation status.

Characteristic	Women with at least on daughter who had had FGM				P-value
	No		Yes		
	n = 1835	81.3%	n = 423	18.7	
Age of respondents (Years)					
15 - 24	387	96.5	14	3.5	<0.001
25 - 34	830	87.1	123	12.9	
35 - 49	618	68.4	286	31.6	
Religion					
Animist	357	81.1	83	18.9	<0.001
Muslim	957	78.3	265	21.7	
Christian	521	87.4	75	12.6	
Attended school					
No	1487	80	372	20	<0.001
Yes	348	87.2	51	12.8	
Socio-economic status					
Low	869	83.1	177	16.9	0.041
High	529	30.3	246	20.3	
Region					
Center-east	340	77.6	98	22.4	<0.001
East	397	91.5	37	8.5	
Haut-Bassins	374	82.2	81	17.8	
Plateau Central	338	73	125	27	
South West	386	82.5	82	17.5	
Ethnic group					
Mossi	734	77.7	211	22.3	<0.001
Bissa	218	77.9	62	22.1	
Gourmatche	311	93.7	21	6.3	
Lobi/Birifor	284	82.6	60	17.4	
Others	288	80.7	69	19.3	
Maternal history of FGM					
No	592	96.6	21	3.4	<0.001
Yes	1229	75.4	402	24.6	
Intention to excise daughter					
No	1771	83.1	360	16.9	<0.001
Yes	60	48.8	63	51.2	
Psychological factors					
	Mean score		Mean score		
Social Norm- Women make decision	2		2.29		<0.01
Social Norm- men make decision	1.79		1.88		<0.19
Social support par leaders	2.88		2.94		0.01
Attitude that devalue FGM	3.47		3.21		<0.01
Cultural value	3.19		3.19		<0.01

studied. The proportion of women with uncircumcised daughters was high among 15 to 24 years old women (96.5%), Christians (87.4%), those who attended school (87.2%), lived in the East region (91.5%), were from

Gourmatche ethnic group (93.7%), had not had FGM themselves (96.6%), or did not have the intention to circumcise their daughters (83.1%). Furthermore, the mean score of most OAM factors differ significantly

Table 3. Adjusted odd ratio and 95% confidence interval for female genital mutilation (FGM) in Burkina Faso.

Characteristic	Women that had FGM	
	OR	95% CI
Age of respondents (Years)		
15 - 24	0.26	0.21-0.31
25 - 34	0.59	0.48-0.72
35 - 49	Ref	-
Religion		
Animist	1.17	0.87 - 1.56
Muslim	1.15	0.93 - 1.43
Christian	Ref	-
Attended school		
No	1.1	0.91 - 1.35
Yes	Ref	-
Socio-economic status		
Low	0.94	-
High	Ref	-
Region		
Center-east	1.24	0.80 - 1.92
East	1.5	0.92 - 2.44
Haut-Bassins	0.69	0.31 - 0.73
Plateau Central	3.4	2.21 - 5.21
South West	Ref	-
Ethnic group		
Mossi	0.96	0.74 - 1.25
Bissa	1.47	0.98 - 2.19
Gourmatche	0.48	0.31 - 0.73
Lobi/Birifor	0.87	0.59 - 1.28
Others	Ref	-

between the two groups.

Using maternal FGM status as the outcome of interest (Table 3), the multivariate regression analysis showed that 15 to 24 (OR: 0.26, 95%CI, 0.21 to 0.31) or 25 to 34 years old women (OR: 0.59, 95%CI 0.48 to 0.72) were significantly less likely to have had FGM as compared to older women (35 to 49 years old). Women who lived in the Hauts Bassins region (OR: 0.69; 95%CI 0.31 to 0.73) were significantly less likely than those who lived in the south-west region to have had FGM. Women from the Gourmatche ethnic group (OR: 0.48, 95%CI 0.31 to 0.73) were also less likely to have undergone FGM as compared to women from the other ethnic groups (Dagara, Dioula, Bobo and others). However, women who were Animist (OR: 1.17; 95% CI 0.87 to 1.58) or Muslims (OR: 1.15, 95%CI 0.93 to 1.43) were more likely than Catholic women to have undergone FGM, although the difference was not statistically significant. Those who

lived in the Plateau region (OR: 3.40, 95%CI 2.21 to 5.21) were three times more likely to have had FGM than those from the South.

On the other hand, when using the likelihood of having a circumcised daughter as the outcome of interest (Table 4), the model showed that women who lived in the Center-East region (OR: 2.09, 95%CI 1.00 to 4.35), were Muslim (OR: 1.53, 95%CI 1.09 to 2.14), reported receiving social support from community leaders (OR: 1.37, 95%CI 1.07 to 1.75) or agreed with statement that "women should decide whether to circumcise their daughter" (OR: 1.70, 95%CI 1.30 to 2.23) were significantly more likely to have a circumcised daughter when compared with their counterparts. However, those who were younger 15 to 24 years old (OR: 0.07, 95%CI 0.04 to 0.12) and 25 to 34 years old (OR: 0.31, 95%CI 0.24 to 0.41), had not undergone FGM (OR: 0.18, 95%CI: 0.11 to 0.29), did not intend to circumcise their daughter

Table 4. Adjusted odd ratio and 95% confidence interval for women to have uncircumcised daughter in Burkina Faso.

Characteristic	Having uncircumcised daughter	
	OR	95% CI
Age of respondents (Years)		
15 - 24	7.4	5.00 - 9.88
25 - 34	3.15	2.43 - 4.08
35 - 49	Ref	-
Religion		
Animist	0.64	0.39 - 1.09
Muslim	0.65	0.46 - 0.91
Christian	Ref	-
Attended school		
No	0.79	0.54 - 1.19
Yes	Ref	-
Socio-economic status		
Low	1.1	0.93 - 1.28
High	Ref	-
Region		
Center-east	0.47	0.23 - 0.98
East	0.76	0.34 - 1.71
Haut-Bassins	0.93	0.49 - 1.72
Plateau Central	0.68	0.35 - 1.34
South West	Ref	-
Ethnic group		
Moss	1.25	0.83 - 1.91
Bissa	1.63	0.89 - 2.99
Gourmatche	2.88	1.32 - 6.30
Lobi/Birifor	1.34	0.73 - 2.50
Others	Ref	-
Maternal history of FGM		
No	5.49	3.44 - 8.76
Yes	Ref	-
Intention to excise daughter		
No	2.81	1.73 - 4.56
Yes	Ref	-
Psychological factors		
Social Norm- Women make decision	0.58	0.44 - 0.75
Social Norm- men make decision	1.39	1.07 - 1.83
Social support par leaders	0.78	0.65 - 0.94
Attitude that devalue FGM	1.28	1.02 - 1.61
Cultural value	1.15	0.86 - 1.53

(OR:0.36, 95%CI 0.22 to 0.59), or were from Gourmatche ethnic group (OR: 0.35, 95%CI: 0.16 to 0.76) were significantly less likely to have a circumcised daughter as

compared to older women (35 years+), women with a history of FGM, and women from other ethnic groups (Dagara, Dioula, Bobo and others), respectively.

DISCUSSION

While the prevalence of women of reproductive age who had undergone FGM in Burkina Faso (68.1%), as well as the proportion of those who had circumcised daughters (18.7%) have decreased overtime as compared to 77% in 2003 (EDS, 2003) and 30.2% among their daughters (Karmaker et al., 2011), they remain unacceptably high. More efforts are needed to further reduce the practice of FGM in Burkina Faso.

The results of this study showed that the median age of girls being circumcised was eight years. This is in line with findings from previous studies. Sayet et al. (1996) found that 80% of girls in Egypt were circumcised between the ages of 5 and 9 years old; whereas Satti et al. (2006) found that 20% of girls (4 to 9 years old) in Sudan had undergone FGM. The practice of FGM at such a young age, when girls have no say whatsoever in the decision making process, underscores the need for a more aggressive involvement of the governments to protect these children.

The involvement of medical personnel in the practice of FGM marks a big change in a business historically dominated by traditional practitioners. Although, this involvement commonly referred to as "medicalization" of FGM, will likely decrease the negative health consequences of FGM, it may, however, delay or prevent the development of effective and long-term solutions for the abandonment of this long-standing tradition (Shell-Duncan, 2001). While some policy makers may have encouraged the medicalization of FGM for short term benefits, they should not overlook the ultimate goal of the fight against FGM, which is to ban the practice of FGM altogether.

This study identified several factors associated with the practice of FGM among women of reproductive age and their daughters. Age was strongly associated with the practice of FGM in Burkina Faso. Younger women (ages 15 to 24 and 25 to 34 years) were less likely than older women (34+) to have undergone FGM. Furthermore, younger women were less likely than older women to have circumcised daughters. This difference in the prevalence of FGM or the likelihood of having a circumcised daughter between younger and older women could be a harbinger of the loss in favor of this practice. More studies are needed to confirm this change.

Animist and Muslim women were only marginally more likely than Catholics to be circumcised. However, Muslim women were significantly more likely than Catholic women to have a circumcised daughter. While older women underwent FGM to fit in this patriarchal society, this does not seem to be true today. Catholic women's daughters are not likely to be circumcised. In order to bring about changes in this community, interpersonal communications should be organized with Muslim and other key leaders in the community.

The impact of maternal educational attainment on FGM

was counterintuitive. There was no significant difference in the prevalence of FGM by maternal educational attainment. Even the likelihood of having a circumcised daughter did not differ between women who attended or did not attend school. The impact of maternal educational attainment on FGM remains controversial in the literature. In a study of 15 countries conducted in 2005, UNICEF (2007) found a positive relationship between maternal educational attainment and FGM in eight countries, no relationship in six countries, and a negative relationship in one country, Nigeria, where the likelihood of having at least one circumcised daughter was greater among women with some education. The interaction with other variables (religion, ethnicity, etc.) may explain this finding. For example in the case of Nigeria, ethnicity was found to be an important confounding factor.

FGM is practiced across all regions in Burkina Faso. However, women living in the Plateau Central as well as those from the Central East were at high risk of FGM as compared to those from the South West. The regional variations in the prevalence of FGM are probably accounted for by the ethnic group distribution and the prevailing religion in the area (Carr, 1997; Hayford and Trinitapoli, 2009).

Women who underwent FGM were less likely to have their daughters circumcised. Although, FGM is so deeply entrenched in the social, economic and political structures of the community that its abandonment is perceived as a loss of status and protection (UNICEF, 2007); the low prevalence of FGM among young mothers and their daughters is a positive sign of change over time. FGM is no longer being practiced systematically on every girl. The Government of Burkina Faso should involve women who have defied this deeply rooted ritual in its interventions aimed at reducing the practice of FGM in Burkina Faso. For example, these women could serve as spokespersons in mass media campaigns or as peer educators.

The sentence should read: Maternal intention to circumcise daughters was also an important factor in the likelihood of circumcising a daughter. Many health behavior theories such as TRA (Fishbein and Ajzen, 1975) etc. share a common belief that intention is the single best predictor of an individual's behavior in a wide range of health domains (smoking, drinking, dental behavior, health screening, etc). Although there is a gap between intention and action (Kelley and Abraham, 2004), many reviews and meta-analyses support the predictive power of intention, showing that intention accounts for 20 to 40% of the explained variance of several behaviors (Cohen, 1992; Sheeran, 2002; Hagger et al., 2002; Godin and Conner, 2008).

Women who agreed with the statement that "women should decide whether to circumcise their daughter" and those who reported receiving support from community leaders were more likely to have a circumcised daughter when compared with those who did not. Community

leaders are generally old men. They are likely to enforce the existing social norms. Even if a girl's mother or another female relative makes the decision whether to circumcise the daughter, the decision is likely to fall in line with the established patriarchal norms of ensuring that the girl remains an accepted community member (Mackie and LeJeune, 2009).

While the large sample size as well as the sampling approach constitutes a major strength for this study, they also have some limitations. Information on FGM status was self-reported by women who participated in the study without any attempts to validate it through physical inspection or medical record review. Considering that FGM is a very sensitive and stigmatizing social issue in Burkina Faso, this leaves room to question the truthfulness of a young woman when questioned by an unknown interviewer. The likelihood for women to give culturally acceptable answers to the interviewer constitutes a real concern.

To conclude, the results of this study show that the practice of FGM is still high in Burkina Faso, despite the government's active involvement in the fight against it. However, the low prevalence of FGM among younger women and their daughters may be an indication of behavior change. Reports that FGM has decreased among groups in practicing countries (e.g. Ethiopia) further confirm that the fight against FGM can be won. Efforts to challenge the prevailing social norm should be reinforced, and focus on organizing young women who have abandoned the practice of FGM. Their social network should be made aware of their rejection of the FGM practice. Concomitantly, awareness-raising education and female empowerment and skill building programs should be put into place. Only through integrated community interventions can we unravel this deeply entrenched social practice.

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Full Length Research Paper

Knowledge, attitude and practice of university students towards smoking in Irbid, Jordan

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The purpose of this cross sectional study was to explore university students' knowledge, attitude and practice towards smoking and to compare these factors between smokers and non-smokers. A sample of 2793 students was randomly selected to complete a self-administered questionnaire about knowledge, attitude and practice of smoking at three universities in Irbid, Jordan. The Majority of the smoking students (75.2%) knew the adverse effects of smoking. Rates of non-smoking students who knew the adverse effects of smoking were significantly higher than that of students who smoke. A high rate of students showed an opposing attitude towards the assumption that smoking females would have more friends (89.6%), have stronger personality (93.4%), and be more attractive (90.6%) than non-smoking females. Similar higher rates of negative attitude were also observed towards the smoking male. About 50% of smokers have a misguided belief that smoking helps them concentrate while studying and 37.7% believe that smoking helps in avoiding obesity. Students that started smoking before enrollment in a university had a significantly higher rate of heavy smoking as compared to those who started smoking after being enrolled. Students smoke not because they lack the knowledge about the risk of smoking but due to misguided beliefs and attitudes.

Key words: Attitude, knowledge, practice, smoking, students, university.

INTRODUCTION

The World Health Organization (WHO) has estimated that five million deaths occur annually due to tobacco use and this number of deaths is expected to reach more than eight million by the year 2030 (Gajalakshmi et al., 2004; WHO, 2009). About 80% of this number will be in developing countries (WHO, 2009). However, the exact magnitude of the problem of smoking in developing countries is not well defined. There is little information to describe the characteristics of smoking patterns in these countries (Gajalakshmi et al., 2004). Smoking has a great economic burden by causing a decrease of economic

productivity and high health care expenditures in addition to the cost of tobacco (Ruff et al., 2000).

Smoking also has an environmental impact due to second hand (passive) smoking (El-Ansari, 2002). The impact of smoking is not limited on the smokers, but it can spread to affect the non-smokers as well. Second hand smoking has an impact on birth outcomes represented in low birth weight (Abu-Baker et al., 2010), and contribute significantly to respiratory tract infections in infants (Jones et al., 2011).

It is well known that cessation of smoking is extremely difficult. This statement is supported by research that has proved beyond doubt that nicotine is highly addictive (Rugkasa et al., 2001). Smoking prevalence rises sharply during adulthood. This means that there is an induction of smoking even after high school (Torabi et al., 2002).

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Between 1991 and 1997, the rate of smoking had increased by 32% among 18 to 24 years old adults in the USA (Torabi et al., 2002). Studying smoking behavior and attitude among this sector of the population will add valuable information about the patterns of smoking among this age group (Vakefliu et al., 2002). In addition, knowledge about previously identified socio-environmental factors associated with smoking among college students in developing countries is limited (Pickett et al., 2000; Moore, 2001).

In Jordan, the prevalence of smoking in university students ranged from 29.8 to 35% (Khader and Alsadi, 2008; Madanat et al., 2008, 2009). University students are considered the second target of marketing strategies of tobacco companies (Torabi et al., 2002). The effects of promotional campaigns reach all students regardless of gender, age, year in school, university or discipline (Wannamethee et al., 1995; Torabi et al., 2002). The environment of the university offers several possible channels to either discourage or encourage smoking among students (Torabi et al., 2002). Many surveys have been done to identify smoking patterns of this group by studying knowledge, attitudes and practices among university students (Ruff et al., 2000; Seguire and Chalmers, 2000; Rugkasa et al., 2001; Torabi et al., 2002; Vakefliu et al., 2002; Thomas and Perera, 2006; Subhane et al., 2009) however little is known about that in Jordan. The aims of this study were (1) to explore the knowledge, attitude and practice (KAP) of university students towards smoking in Jordan, (2) to compare the knowledge and attitude of smokers versus non-smokers towards smoking, and (3) to compare the attitude of males and females towards students who smoke.

MATERIALS AND METHODS

Target population and sampling

This study targeted the under graduate students of three universities located in Irbid governorate, Jordan. These were Jordan University of Science and Technology (JUST), Yarmouk University (YU), and Irbid Private University (IPU). Both JUST and YU are public universities. JUST consists of ten undergraduate colleges, some of which in other countries would be considered as post-graduate schools that mainly focus on scientific studies, such as medicine, dentistry, pharmacy and engineering. YU on the other hand consists of 11 undergraduate colleges that concentrate on humanitarian studies. IPU consists of three colleges with both professional and educational specialties. All the three universities enroll students of both genders, and from different socioeconomic levels, diverse backgrounds and geographic regions of Jordan. Students were stratified according to the university, college and then according to the year of study in the college. A stratified weighted random sample was selected from each university.

Study design and instruments

A cross-sectional study design was used to assess smoking patterns among university students. A modified Arabic version questionnaire of the global youth tobacco survey that was designed

by the Center for Disease Control (Centers for Disease Control and Prevention, 2002) was used. A pilot test of the data collection instrument was carried out in two medical and engineering classes at JUST. As a result, some appropriate modifications were made, mainly in editing and organization. Some questions were joined in a box to separate them from the others, some words were written in bold and different size to make the questions clear, readable and easy to follow.

Data were entered and analyzed using Statistical Package for Social Sciences (SPSS) version 11 software. The response of the knowledge, attitude and practice questions was dichotomous (yes or no). The comparison between the positive answers to questions in smoker and non-smoker groups, and male and female groups was tested using the Chi-square test.

RESULTS

Demographic data

The total sample size that responded was of 2793 students, representing almost 8.6% of the total enrolled active students in the three universities. Out of the total enrolled students, a sample of 1235 (44.2%), 1204 (43.1%) and 354 (12.7%) students representing JUST, YU and IPU, respectively was selected at random. Male/female students constituting the sample from three universities were 820/415, 760/444 and 230/124, respectively. On an average, the distribution of the sample population based on gender was 64.8% males and 35.2% females. The age range was 18 to 24 years with a median of 22 years. The prevalence rate of smoking in the three university students was 29.3%. It was 41.8% in males and 6.4% in females.

Knowledge

The majority of these students were well aware that smoking causes dangerous diseases (86.7%) and that passive smoking has a negative impact on others (86.9%). Comparison of this knowledge between smokers and non-smokers revealed that there is a significant difference ($P < 0.05$) between the two groups concerning this issue (Table 1). The percentage of smokers who knew that smoking causes dangerous diseases was 75.2%, which was significantly lower than that of non-smokers (91.5%). Also, the percentage of non-smoking students who were aware of the adverse effects of passive smoking on people around smokers was significantly ($P < 0.05$) more (92.4%) than that of students who smoke (73.8%) (Table 1). A high percentage (73.7%) of all the sample students knew that smokers cannot quit smoking easily, but there was no significant difference ($P > 0.05$) between the rates of smokers and non-smokers in regards to knowledge about how smoking can be addicting (Table 1).

Attitude

The attitude of smoking students towards the idea that

Table 1. Knowledge of the adverse effects of smoking among university students in Jordan.

Questionnaire statement	Total*	Answered "yes"		Answered "no"	
		N	%	N	%
Smoking causes serious diseases					
Smoker	819	616	75.2	203	24.8
Non-smoker	1970	1803	91.5*	167	8.5
Total	2789	2419	86.7	370	13.3
Passive smoking hurts					
Smoker	816	602	73.8	214	26.2
Non-smoker	1965	1815	92.4*	150	7.6
Total	2781	2417	86.9	364	13.1
Smoker can quit smoking easily					
Smoker	817	223	27.3	594	72.7
Non-smoker	1968	510	25.9	1458	74.1
Total	2785	733	26.3	2052	73.7

N: Number; *N Answered the question, *P<0.05.

smoking helps them fit in a group of friends was examined. It was found that students who smoke are more likely to have this attitude (19.0%) as compared to students who do not smoke (10.1%) ($P < 0.05$) (Table 2). Only 10.4% of the students believed that a smoking female student has more friends than a non-smoking female student. However, the rate of smoking students who believed that a smoking female has more friends (12.8%) was significantly higher ($P < 0.05$) than that of non-smoking students (9.5%) (Table 2). On the other hand, the rate of students who believed that a smoking male student has more friends than a non-smoking male student was 21.9%. Here however, the rate of non-smoking students that believed a smoking male has more friends (23.6%) was actually higher than that of smoking students (17.9%) ($P < 0.05$) (Table 2).

A low percentage (6.5%) of students believed that a smoking female student has a strong personality. However, the relationship between being a smoker and believing that a smoking female has a strong personality was found to be significant ($P < 0.05$) (Table 2); as 11.3% of smoking students believed so, whereas only 4.6% of non-smoking students found that to be true (Table 2). On the other hand, 8.3% of students believed that a smoking male has a strong personality. Here again, there was a significant difference ($P < 0.05$) between smokers and non-smokers concerning this belief. Smoking students who believed that a smoking male has a strong personality (12.1%) were almost twice as much as non-smokers (6.7%) (Table 2).

With regards to a smoking female being more attractive (to males) by being a smoker, only 9.4% of students believed so as compared to 90.6% who thought the contrary (Table 3). We found that 20.1% of the smokers see that a smoking female is more attractive, while only

5% of non-smokers believed so ($P < 0.05$) (Table 2). On the other hand, when we assessed the attitude of students towards the idea of a smoking male being more attractive (to females) as a result of smoking, we found that only 12.9% of the students believed so (Table 2). Result also showed that 18.5% of smokers find a smoking male to be more attractive, while only 10.6% of non-smokers share the same thought ($P < 0.05$) (Table 2).

Students who believed that smoking helps them concentrate while studying represented 20.3% of the participants (Table 2). When comparing the attitude of smokers and non-smokers regarding this issue, we found that there is a significant difference ($P < 0.05$). The rate of smokers who thought that smoking helps them concentrate while studying was 46.9%, while the rate of non-smokers was merely 9.3% (Table 2).

When addressing the attitude of students towards the idea that smoking helps in avoiding obesity, we found a significant difference ($P < 0.05$) between smokers and non-smokers. Smokers who believed that smoking helps in avoiding obesity were 37.7% as compared to 28.9% of non-smokers (Table 2).

When looking at a suggestion to conjure up a university law that would ban smoking, non-smokers showed a highly supportive attitude towards applying this ban (84.7%), while only one third of the smokers said that they would support such a law (33.4%) ($P < 0.05$) (Table 2).

When comparing the attitude of students, according to gender, towards personality and attractiveness related to smoking, we found that more males than females believe smoking female to have a stronger personality and are more attractive than non-smoking female (Table 3). On the other hand, more females than males believe that

Table 2. Attitude of university students toward smoking in Jordan.

Questionnaire statement	Total ⁺	Answered "yes"		Answered "no"	
		N	%	N	%
Smoking increases ability to fit in a group					
Smoker	815	155	19.0*	660	81.0
Non-smoker	1963	198	10.1	1765	89.9
Total	2778	353	12.7	2425	87.3
Female smoker has more friends					
Smoker	815	104	12.8*	711	87.2
Non-smoker	1963	186	9.5	1777	90.5
Total	2778	290	10.4	2488	89.6
Female smoker has a strong personality					
Smoker	805	91	11.3*	714	88.7
Non-smoker	1963	90	4.6	1873	95.4
Total	2768	181	6.5	2587	93.5
Female smoker is more attractive					
Smoker	811	163	20.1*	648	79.9
Non-smoker	1964	99	5	1865	95
Total	2775	262	9.4	2413	90.6
5-Male smoker has more friends					
Smoker	816	146	17.9	670	82.1
Non-smoker	1967	464	23.6*	1503	76.4
Total	2788	610	21.9	2173	78.1
Male smoker has a strong personality					
Smoker	817	99	12.1*	718	87.9
Non-smoker	1960	132	6.7	1828	93.3
Total	2777	231	8.3	2546	91.7
Male smoker is more attractive					
Smoker	817	151	18.5*	666	81.5
Non-smoker	1969	209	10.6	1760	89.4
Total	2786	360	12.9	2426	87.1
Smoking helps student concentrate while studying					
Smoker	819	384	46.9*	435	53.1
Non-smoker	1973	183	9.3	1790	90.7
Total	2792	567	20.3	2225	79.7
Smoking helps in avoiding obesity					
Smoker	819	309	37.7*	510	62.3
Non-smoker	1974	570	28.9	1404	71.1
Total	2793	879	31.5	1914	68.5
Agree to apply university law to ban smoking					
Smoker	1696	1667	84.7*	302	15.3
Non-smoker	811	271	33.4	540	66.6
Total	2780	1938	69.7	842	30.3

N: Number; ⁺N Answered the question, *P<0.05.

Table 3. Attitude of university students towards smokers according to sex

Questionnaire statement	Total		Male		Female	
	Average N = 2778 ⁺		Average N = 1800		Average N = 978	
	Answered yes		Answered yes		Answered yes	
	N	% ⁺⁺	N	% ⁺⁺	N	% ⁺⁺
Female student smoker has a strong personality	181	6.5	136	7.6*	45	4.6
Male student smoker has a strong personality	231	8.3	148	8.2	83	8.5
Female student smoker is more attractive	262	9.4	219	12.2*	43	4.4
Male student smoker is more attractive	360	13.0	209	11.6	151	15.4*

N: Number; ⁺Average N responded to the question; ⁺⁺Calculated from average responded N; *P<0.05.

smoking males to be more attractive, but there was no difference between males and females in relation to thinking that a smoking male has a strong personality (Table 3).

Practice

Study result showed that majority of smoking students (79.3%) smoke 5 to 7 days per week. There is a significant relationship ($P < 0.05$) between when a smoking student first started smoking and the number of days he/she smokes per week. Smokers who started smoking before enrollment in a university usually smoke 5 to 7 days per week (83.6%), while those smokers who started smoking after being enrolled have a significantly ($P < 0.05$) lower rate (68%) of smoking per week (Table 4). There is also a significant relationship ($P < 0.05$) between the number of cigarettes smoked per day and the time a smoking student first started smoking (Table 4). We found that students who started smoking before enrollment in a university consume significantly ($P < 0.05$) larger number of cigarettes as compared to students who started smoking after enrollment (Table 4). It was found out that only 39.2% of those who started smoking before enrolling in a university were relatively light smokers (1 to 15 cigarettes/day), while 63.2% of smokers who started smoking after enrollment in the university were light smokers. On the other hand, the prevalence rates of heavy smokers (≥ 16 cigarettes/day) among students who started smoking before and after enrollment in a university were 60.8 and 36.8%, respectively (Table 4).

The rate of students who smoke local brands of cigarettes (61.4%) was higher than those who smoke imported brands (38.6%). This issue is gender related, as there is a significant difference ($P < 0.05$) between males and females regarding the brand of cigarettes they smoke (Table 4). The rates of male and female students who smoke local cigarettes were 63.7 and 33.9%, respectively. On the other hand smoking females recorded a significantly ($P < 0.05$) higher percentage of smoking imported cigarettes (66.1%) as compared to smoking males (36.3%) (Table 4). About 53.8% of

smoking students used other forms of tobacco products such as a hookah (also known locally as “shisha” or “argilah” and in other countries as “nargile” (Table 4). There is no significant difference ($P > 0.05$) between males and females concerning this issue. The percentages of smokers who used other forms of tobacco products were 63.5% for smoking females and 53% for male smokers (Table 4). More than half of the student smokers (58.1%) have the desire to quit smoking. There is a significant difference ($P < 0.05$) between males and females concerning this issue. Smoking Males who wanted to quit were 59.9%, while smoking females who had the same desire were 36.5% (Table 4).

Smoking has a heavy impact on the economic status of the students, since a smoking student spends on average 38.6% of his/her monthly allowance on smoking. This may have a negative impact on other aspects of the students' life that requires finances.

DISCUSSION

The prevalence of smoking in university students (29.3%) is in accordance with other studies in Jordan (Khader and Alsadi, 2008; Madanat et al., 2008, 2009). We have explored important factors related to knowledge, attitude and practice of university students towards smoking. Most of the university students, regardless of their smoking status, have good knowledge about the harmful effects of smoking. However, we showed that smoking students have a lesser extent of that knowledge than non-smoking students. This might be explained by the fact that smokers in part experience self-denial towards such information and/or seriously underestimate the rates of future complications and death associated with smoking as long as they are feeling healthy. Similar results are also found in university students in both developing and developed countries (Wechsler et al., 1998; Ruff et al., 2000; Seguire and Chalmers, 2000).

Most of the students believe that smoking females do not have more friends; a similar result was also found in other studies (Abdullah and Husten, 2004). The rate of smokers who believed that smoking females have more

Table 4. Smoking practice of university students in Jordan.

Time students started smoking	Number of days student smoked last week				
	Total	1 - 4		5 - 7	
	N	N	%	N	%
Before enrollment in a university	587	96	16.4	491	83.6*
After enrollment in a university	228	73	32.0	155	68.0
Total	815	169	20.7	646	79.3

Time students started smoking	Total	Number of cigarettes smoked per day			
		1 - 15		≥16	
		N	%	N	%
Before enrollment in a university	587	230	39.2	357	60.8*
After enrollment in a university	228	144	63.2	84	36.8
Total	815	374	45.9	441	54.1

Gender of smoker	Total	Brand of cigarettes smoked			
		Local		Imported	
		N	%	N	%
Male	754	780	63.7 *	274	36.3
Female	62	21	33.9	41	66.1*
Total	816	501	61.4	315	38.6

Gender of smoker	Total	Smoker uses other form(s) of tobacco			
		Yes		No	
		N	%	N	%
Male	753	399	53.0	354	47.0
Female	63	40	63.5	23	36.5
Total	816	439	53.8	377	46.2

Gender of smoker	Total	Student wants to quit smoking			
		Yes		No	
		N	%	N	%
Male	753	451	59.9*	302	40.1
Female	63	23	36.5	40	63.5
Total	816	474	58.1	342	41.9

N: Number; *P < 0.05.

friends was more than that of non-smokers. This may be because smokers tend to gather together. One study (Seguire and Chalmers, 2000) said that smokers are perceived as friendly approachable people who had a common interest.

Some smokers thought that smoking helps them fit in with their peers; this was more pronounced among females. This may be because they feel that they are more accepted as smokers within their friends who are in most cases smokers as well. A study done by Seguire and Chalmers (2000) proposed that this may be due to the feeling of insecurity in social situations, and that one way to get rid of this feeling is to smoke so as to get an immediate connection with the group as every one is smoking. Gaining peers acceptance and sense of identity

can easily be acquired by smoking (Seguire and Chalmers, 2000).

Only 6.6% of the students believe that a smoking female has a strong personality, so smoking female who think the opposite are mistaken and misguided. We also revealed that males are more likely to believe that a smoking female has a strong personality. This may be because they might think that she broke social barriers and common expectations by becoming a smoker. It is normal for smokers to support this attitude, because they are supporting themselves. It is worth mentioning, that the community in Jordan traditionally looks down at the idea of a smoking female. On the other hand, there was no difference among males and females regarding the idea that a smoking male has a strong personality,

because there is no social barrier to be broken; it is just accepted for males to smoke.

Prior studies reported that students in general see smokers as being unattractive (Biasco and Hartnett, 2002; Vakefliu et al., 2002). We proved the same attitude, since majority of these students do not see smokers, whether being females or males, as being attractive. However, the idea that smoking is attractive was found to be truer for the opposite gender. In other words, it was found out that more males than females see the smoking female as attractive and more females than males see the smoking male as attractive. This factor alone is enough for many students to justify smoking especially in communities where friendship between male and female is very strict and limited.

About half the smokers believe that smoking helps them concentrate while studying. Student's grades and passing university examinations are some of the most important factors in building their future careers at this stage of a student's life. In other words, the core of the student's focus is to succeed and obtain high grades. They may take the risk of smoking for the sake of concentrating while studying. This negative attitude might be the most important factor to be considered in any smoking control program for university students. This wrong attitude and belief is contrary to the scientific fact that some of the substances included in cigarettes cause confusion and cognitive modifications (Lecacheux et al., 2009). In addition and in other studies, they found that smoking affects cognitive function and reduces mental performance in the long run, also the first direct biological evidence that smoking destroys brain cells has been proven (Richards et al., 2003). When the student smokes a cigarette, he will not be distracted by thinking of the next one, so a part of this belief may be psychological. Therefore, correcting this wrong attitude of "smoking helps me concentrate while studying" should be highly concentrated on in any smoking control program.

Smokers recorded the highest percentages in regards to the belief that smoking helps in avoiding obesity as compared to non-smokers. The relationship between smoking and body weight is complicated. Some studies revealed that smoking might cause irregularities in nutrient intake due to the enzymatic effects of smoking. Another suggestion was that smoking changes the taste in a smoker's mouth, which in turn leads to difference in dietary intake (Dallongeville et al., 1998). One might ask, is smoking the right way to control obesity?

Smokers showed a negative attitude toward applying university laws that would ban smoking because they do not want to be restricted. On the other hand, non-smokers showed a positive attitude toward such laws. This is most likely because non-smokers are annoyed by the smell of burning cigarettes and smoke and/or they do not want to be exposed to the effects of second hand smoke. Prior studies found that although students view smoking as harmful, they do not want more restrictions

by law (Biasco and Hartnett, 2002).

We found out that the number of cigarettes smoked per day is associated with the time the student first started smoking. The students who start to smoke before enrollment in a university usually smoke more cigarettes than those who start after being enrolled. This can be explained by the fact that smokers are becoming more addicted to nicotine.

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Full Length Research Paper

Epidemiology of astrovirus infection in young children hospitalized with gastroenteritis in Iran, over a period of seven years, using reverse Transcriptase-polymerase chain reaction (RT-PCR)

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Human astroviruses have been increasingly identified as important agents of diarrheal disease in children. Outbreaks of diarrhea due to astrovirus have frequently been reported and astroviruses have also been associated with nosocomial infections in hospitals. A 7-year study involving 2,490 gastroenteritis samples was conducted to determine the prevalence and age distribution of human astrovirus infection as well as the seasonality pattern in 5 different cities of Iran using reverse Transcriptase-polymerase chain reaction (RT-PCR). Astrovirus was detected in 40 of 2490 specimens tested by RT-PCR, and astrovirus infection was confirmed by Southern hybridization. Detection rates were higher in winter, although astrovirus infections also occurred in summer months. The overall incidence of astrovirus was found to be 1.6%. The mean age of infected children was 14.7 months, and the median age was 15 months. Majority of the infected children were less than 2 years of age making up 36 (90%) infected children, only 4 cases of infected children were more than 2 years of age (10%). The difference between the two age groups was statistically significant ($P < 0.02$). Our findings provide evidence that astrovirus can be a leading cause of viral gastroenteritis infections and highlight the need to implement astrovirus detection assays in association with rapid rotavirus and adenovirus detection enzyme immunoassays (EIAs) for the clinical diagnosis and nosocomial prevention of viral gastroenteritis infections in pediatric departments.

Key words: Astrovirus, reverse Transcriptase-polymerase chain reaction (RT-PCR), gastroenteritis, pediatric, prevalence.

INTRODUCTION

Astroviruses are non-enveloped single-stranded RNA viruses that were first detected in 1975 by electron microscopy in stool specimens from children with acute gastroenteritis (Madeley and Cosgrove, 1975). The astrovirus genome contains three open reading frames

(ORFs): ORF1a and ORF1b, which encode the viral protease and polymerase, respectively, and ORF2, which encodes the capsid precursor.

Human astroviruses have been increasingly identified as important agents of diarrheal disease in children and the elderly. The main symptom of infection is watery diarrhea, which is often associated with vomiting, fever, and abdominal pain (Matsui and Greenberg, 1996). Outbreaks of diarrhea due to astrovirus have frequently

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Table 1. Primers used for astrovirus detection using RT- PCR.

Primer	Gene	Location	Polarity	Sequence (5'-3')
Mon 340	ORF1	1182-1203	+	CGTCATTATTTGTTGTCATACT
Mon 348	ORF1	1450-1470	-	ACATGTGCTGCTGTTACTATG

been reported (Belliot et al., 1997; Mitchell et al., 1995; Noel and Cubitt, 1994; Oishi et al., 1994; Taylor et al., 1997), and astroviruses have also been associated with nosocomial infections in hospitals (Shastri et al., 1998; Unicomb et al., 1998). They have also been detected in immunocompromised (Noel and Cubitt, 1994) and AIDS-infected patients (Liste et al., 2000). Astrovirus infections occur worldwide, and their incidence in children with gastroenteritis in both developing and developed countries ranges from 2 to 9% (Bon et al., 1999; Foley et al., 2000; Gaggero et al., 1998; Mustafa et al., 2000; Svenungsson et al., 2000; Walter and Mitchell, 2000), although some studies report prevalences up to 26% (Maldonado et al., 1998).

Although astrovirus epidemiological studies have been commonly based on electron microscopy and enzyme immunoassay techniques, during the past few years the number of surveys using molecular techniques, mainly reverse Transcriptase-polymerase chain reaction (RT-PCR), has substantially increased. There is a widespread belief that astrovirus incidence may have been underestimated, since enzyme immunoassay is far less sensitive than RT-PCR (Mitchell et al., 1995; Gaggero et al., 1998). Furthermore, seroprevalence studies indicate that most children acquire astrovirus antibodies during the first years of life (Koopmans et al., 1998; Kriston et al., 1996). Consequently, a new appreciation for the role of astrovirus in diarrheal disease has evolved, and in many cases, astroviruses are regarded as the second most common cause of viral gastroenteritis in children after rotavirus (Glass et al., 1996; Herrmann et al., 1991).

The aim of the present study was to determine the prevalence and age distribution as well as the seasonality pattern of astrovirus infections from children with gastroenteritis in 5 different cities of Iran, during a 7-year period using RT-PCR.

MATERIALS AND METHODS

Stool samples

Between May, 2002 and April, 2008, 2,490 fecal samples were collected from infants and children with gastroenteritis who were admitted to one of the hospitals involved in the present clinical study from 5 different cities. Studied patients had a minimum age of 30 days and a maximum of 4 years. Mean age of the studied patients was 48 months. From 2490 fecal samples, 414 were from Bandar Abbas, 394 from Tabriz, 624 from Tehran, 325 from Mashhad and 733 from Shiraz. For astrovirus detection, stools were suspended (10%, w/v) in phosphate-buffered saline containing 2 M NaNO₃, 1% bovine serum albumin; fraction V, and 0.1% Triton X-

100 (pH 7.2) and pelleted at 1,000 ×g for 5 min, and the resulting supernatant was stored at -70°C for later analysis.

Astrovirus detection

Astrovirus was detected by RT-PCR after extraction of its RNA and subsequently confirmed by Southern blot hybridization with an internal probe. RNA was purified from 50 µl of fecal supernatant by guanidine thiocyanate extraction, as previously described (Boom et al., 1990). RT-PCR was carried out with primers Mon 340 and 348, which amplify a fragment of ORF1a (Table 1). Five microliters of the extracted RNA was heated to 99°C for 5 min and was immediately placed on ice. First-strand cDNA was synthesized at 42°C for 60 min by adding 1 µM primer Mon 348 and 3 U of reverse transcriptase (Expand; Roche) in 10 µl (final volume) containing 50 mM Tris-HCl (pH 8.3), 40 mM KCl, 5 mM MgCl₂, 10 mM dithiothreitol, 0.5 mM Tween 20, and 0.2 mM concentrations of each deoxynucleoside triphosphate. Five microliters of the RT product was amplified using 0.5 U of the expand high-fidelity PCR system enzyme mix (Roche) and 0.5 µM (each) primers Mon 340 and 348 in a total volume of 50 µl containing 5 µl of the expand high-fidelity buffer (Roche), 2 mM MgCl₂, and each deoxynucleoside triphosphate at 0.2 mM. After a denaturation step of 3 min at 95°C, 40 cycles of amplification (94°C, 30 s; 55°C, 30 s; 72°C, 30 s) were performed followed by a final extension of 7 min at 72°C. Ten microliters of the PCR product was analyzed on a 1.5% agarose gel and detected by ethidium bromide staining. PCR products were confirmed by Southern blot hybridization with an internal digoxigenin-labeled probe under stringent conditions (Guix et al., 2002; Mustafa et al., 2000).

Statistical analysis

T-test was used to evaluate the differences between astrovirus incidence among age groups.

RESULTS

Over a 7-year period spanning from May, 2002 to April, 2008, a total of 2490 stool specimens collected from children admitted to one of the hospitals involved in this study with acute gastroenteritis were tested for astroviruses. Detection rates were higher in winter (59%), although astrovirus infections also occurred in summer months (8%) (Figure 5). The overall incidence of astrovirus infection was found to be 1.60% (40 of 2490 total samples); 8 positive samples from Bandar Abbas (1.93%), 3 from Tabriz (0.76%), 7 from Tehran (1.12%), 9 from Mashhad (2.77%) and 13 from Shiraz (1.77%). The age distribution of astrovirus infection for the first 4 cities is as shown in Figures 1 to 4. The mean age of infected children was 14.7 months, and the median age was 15 months. Majority of the infected children were less than 2

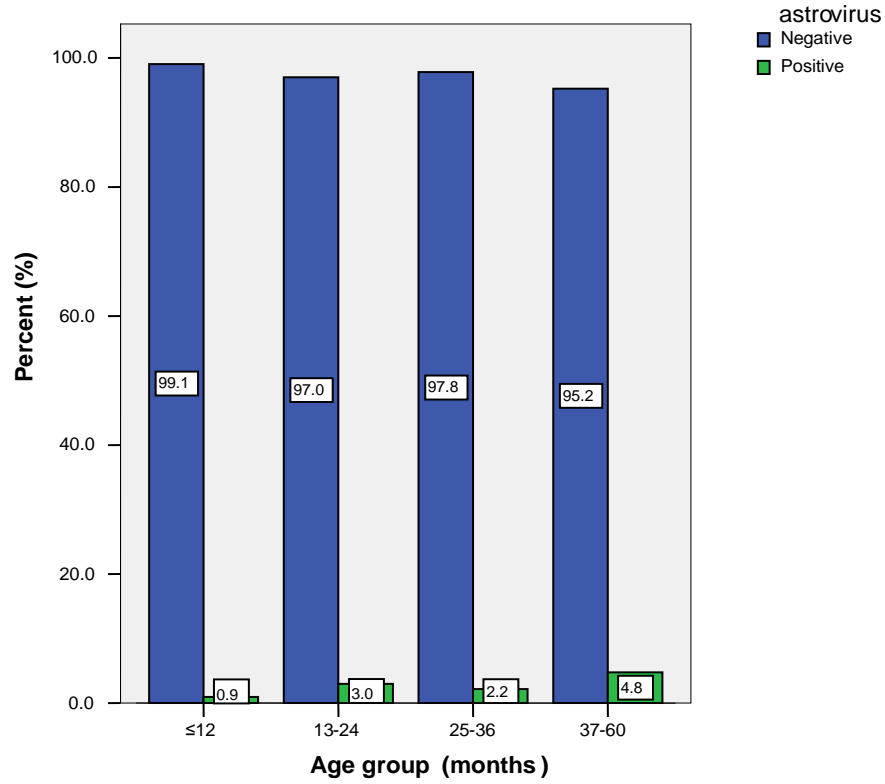


Figure 1. Age distribution of children with astrovirus gastroenteritis from May, 2002 to April, 2008 in Bandar Abbas city.

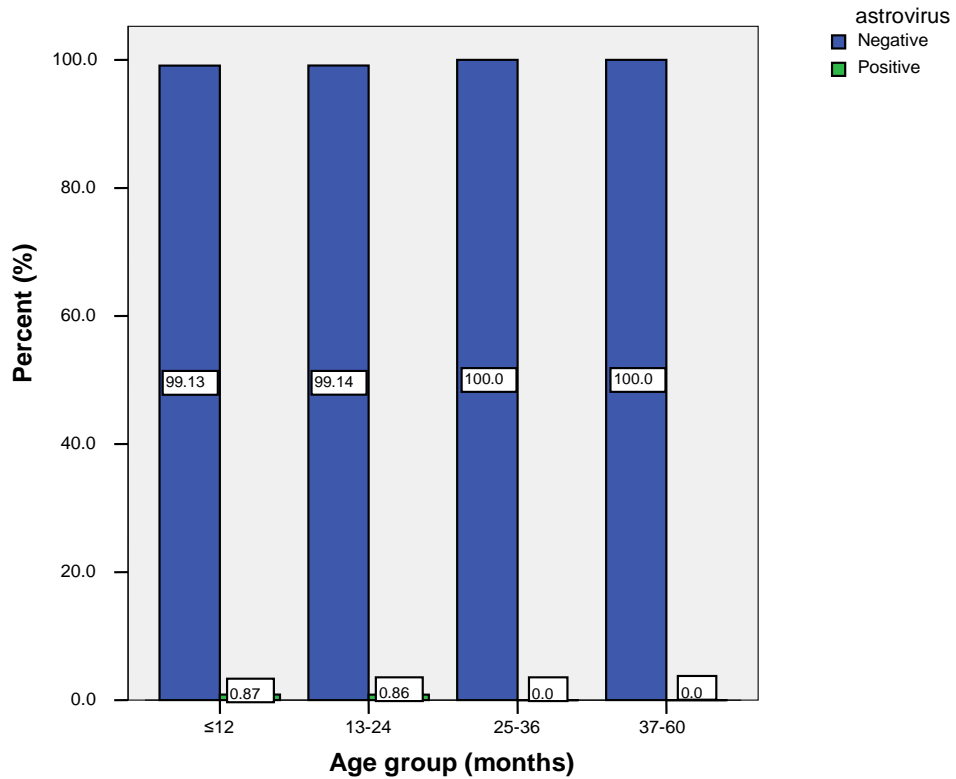


Figure 2. Age distribution of children with astrovirus gastroenteritis from May 2002 to April 2008 in Tabriz city.

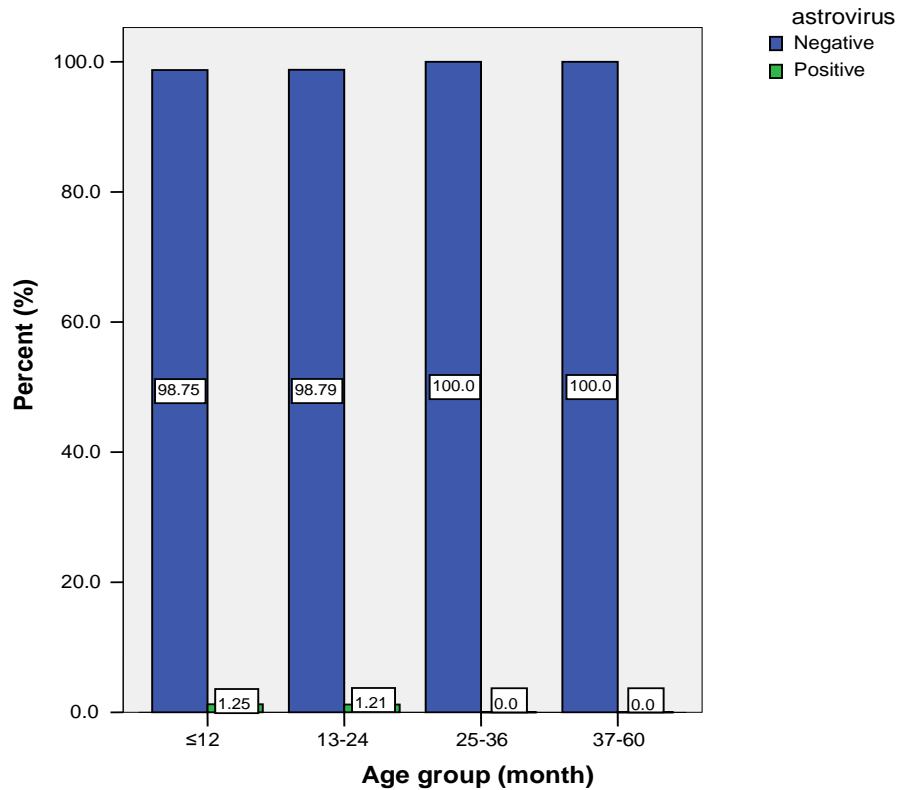


Figure 3. Age distribution of children with astrovirus gastroenteritis from May, 2002 to April, 2008 in Tehran city.

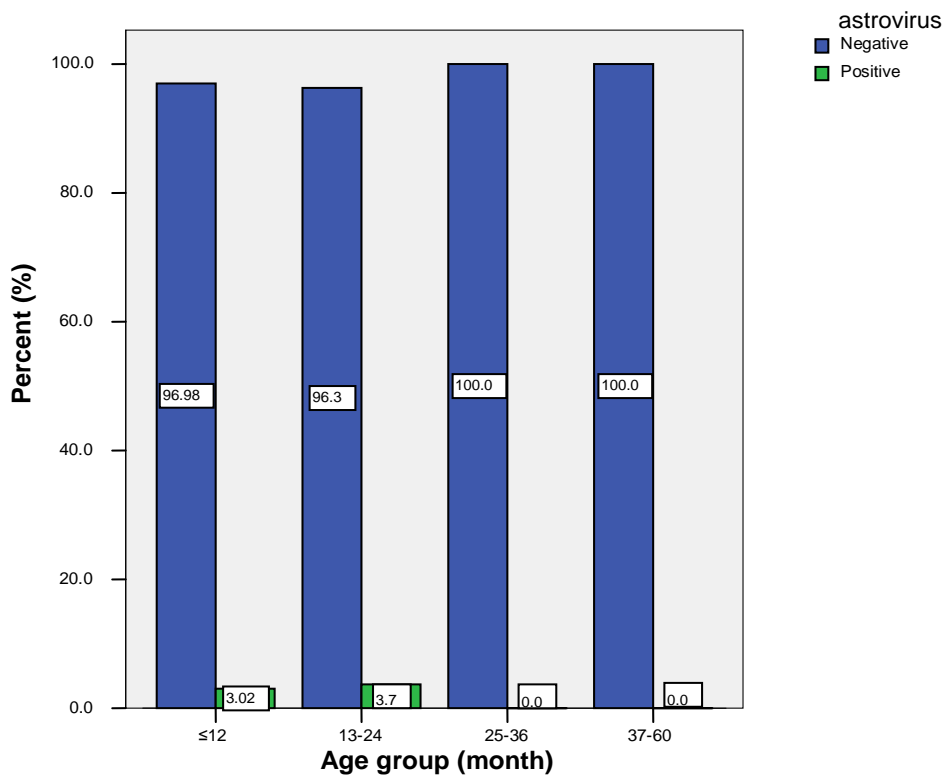


Figure 4. Age distribution of children with astrovirus gastroenteritis from May, 2002 to April, 2008 in Mashhad city.

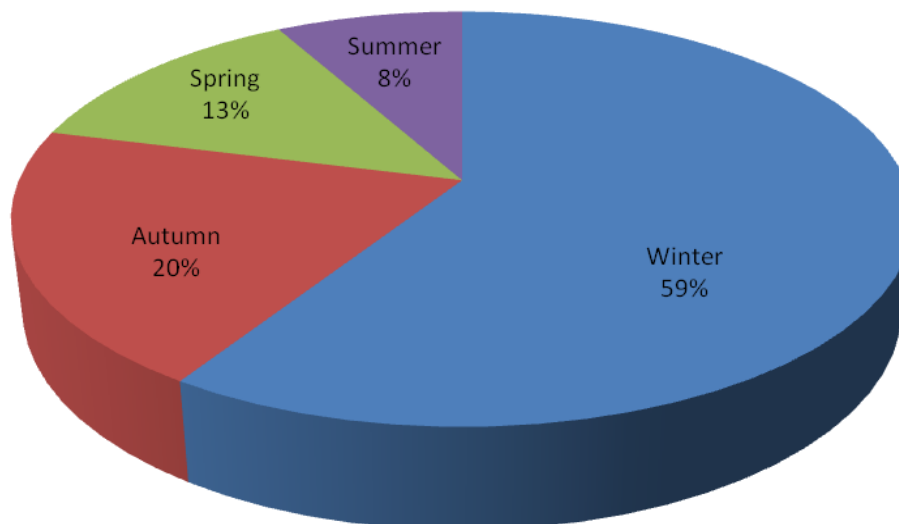


Figure 5. The seasonality pattern of astrovirus gastroenteritis in children from May 2002 to April 2008 in 5 cities of Iran.

years of age making up 36 (90%) of infected children, only 4 cases of infected children were more than 2 years of age (10%). When analyzed by a *t* test, the difference between the two age groups was statistically significant ($P < 0.02$).

DISCUSSION

This is a new study to use molecular techniques (Southern hybridization and RT-PCR) in a long-term prospective study of astrovirus infection in children hospitalized with acute gastroenteritis. Previous epidemiological studies of astrovirus infection in children have been carried out in a variety of set community-based studies using electron microscopy and enzyme immunoassay. Surveys of the incidence of hospitalization due to astrovirus-induced severe gastroenteritis in developed countries have reported rates of 1.5 to 3% (Carter and Willcocks, 1996). In contrast, a study from Chile found that astroviruses were responsible for up to 20% of hospital admissions (Gaggero et al., 1998) which suggests that the burden of astrovirus disease may be greater in developing countries; however, the incidence of astrovirus infection reported in this study is consistent with developed countries.

In a research by Hamkar et al. (2007), the prevalence of astrovirus infection among children hospitalized with gastroenteritis in 3 cities of Northern Iran was reported to be 2.4% whereas in another study conducted in Ahvaz city a higher rate of incidence (15.17%) has been reported which may be due to poor hygienic condition (Mozhgan et al., 2011).

In this study, the maximum detection rate was observed in children under 2 years of age. Reports from

other countries like Mexico, Thailand, Guatemala, France, Australia, Colombia, and Venezuela have shown higher incidences in younger populations as well (Bon et al., 1999; Gaggero et al., 1998; Mustafa et al., 2000; Herrmann et al., 1991; Cruz et al., 1992; Medin et al., 2000). However, in Guatemala and France (Bon et al., 1999; Cruz et al., 1992), the detection rate at the age of 2 was also high.

Detection rates were higher in winter, although astrovirus infections also occurred in summer months. This seasonal pattern is consistent with other epidemiological studies from temperate regions (Matsui and Greenberg, 1996). However, reports exist which describe high astrovirus incidences during spring and summer (Noel and Cubitt, 1994; Herrmann et al., 1991). Nevertheless, some other long-term studies describe a slightly different pattern without a distinct winter peak in each year (Mitchell et al., 1999). Our study showed a winter peak in each 1-year period.

RT-PCR is the most sensitive test for astrovirus detection as described previously (Guix et al., 2002). In a study by Grote et al. (2011), it was revealed that 30% of fecal samples negative for astrovirus by enzyme-linked immunosorbent assay (ELISA) were found to be positive when tested with RT-PCR; this has been repeated in 2 other studies performed in Saudi Arabia and South Korea (Tayeb et al., 2008; Jeong et al., 2011). These findings emphasize the role of RT-PCR as the most sensitive test for virus detection among infected samples.

Conclusively, our findings provide evidence that astrovirus can be a leading cause of viral gastroenteritis infections and highlight the need to implement astrovirus detection assays in association with rapid rotavirus and adenovirus detection enzyme immunoassays (EIAs) for the clinical diagnosis and nosocomial prevention of viral

gastroenteritis infections in pediatric departments.

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Short Communication

Blood group and anemia: Exploring a new relationship

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Anemia is a huge public health and nutrition problem with serious consequences. Though oral supplementation of iron, vitamin B12 and folic acid are most commonly used as a therapeutic measure to correct anemia; it is suggested that the oral supplementation of iron is not the best way to correct anemia especially due to its adverse effect on some other body functions and other complications. Under this situation it is far better to take the preventive measure to combat anemia by taking iron or vitamin rich diet, especially to those who are more prone to anemia. But the type of such population is not known to us. So, the objective of the present study is to find out whether there is any relation of blood group in occurrence of anemia to recommend the appropriate preventive measure to eradicate anemia. For this the whole blood of suspected anemic patients was collected in fasting condition and the RBC count, hemoglobin concentration and blood group of all of the anemic patients were determined. It is observed that O type of individuals are comparatively resistant to anemia in spite of large frequency distribution of O groups in general population whereas anemia is relatively prone to the individuals having blood group B, A or AB.

Key words: Anemia, blood group, iron deficiency anemia, relation between blood group and anemia.

INTRODUCTION

Anemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. As per the World Health Organization (WHO) database on anemia globally, anemia affects 1.62 billion people (95%), which corresponds to 24.8% of the population. WHO also estimates that anemia contributes to about 20% of maternal and perinatal death in developing countries (Harvey, 2004). Though, the oral iron supplementation is a very common therapeutic measure to correct anemia it should be only used when dietary measures have failed. Moreover, iron supplement cannot correct anemia which is not due to iron deficiency (<http://health.nytimes.com/health/guides/disease/anemia/treatment.html>). Besides this, iron replacement therapy

can cause gastrointestinal problems like nausea, vomiting, diarrhea, constipation and even iron tablets can aggravate existing gastrointestinal problems, e.g. ulcers and ulcerative colitis (Notebaert et al., 2007). Long term iron supplementation also contributes to heart disease, diabetes mellitus and certain type of cancers (Maguire et al., 2007). It is also reported that iron tablets may also reduce the effectiveness of other drugs including the antibiotics tetracycline, penicillamine, ciprofloxacin, Parkinson's disease drugs methyl dopa, levodopa, etc (www.anemicause.html/www.anemia.html). It can also result in some acute serious complications like blood clots, joint ache, headache, rashes allergic reaction, etc. Thus, it is a daunting task to ask all the persons to take iron tablets to prevent the occurrence of anemia considering the aforementioned ill effect of iron tablets. But, if it would be possible to determine whether any specific population is prone or resistant to anemia, it would rather be easy to suggest specific dietary advice to prevent the occurrence of anemia in such population.

Whereas blood group exhibits some relation with some

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Table 1. Result showing the frequency distribution of blood group among general non anemic population and anemic population.

Blood group	General population of local belt (%)	Anemic population of same belt (%)
A	22	28
B	38	42
AB	8	12
O	32	18
Rh+	94	94
Rh-	6	6

common diseases and if such relation is found existing between anemia and blood group, then it will become very easy to predict the type of population which is more prone or resistant to anemia and thus help us to recommend such population for taking preventive measure so that anemia can be eradicated in such population. So, the objective of the present study is to find out the existence of any correlation between blood group and anemia which may guide to recommend the appropriate preventive measures in preventing the occurrence of anemia in such population.

MATERIALS AND METHODS

Selection of subjects

For this study, 276 anemic patients of Haldia and Tamluk subdivision reporting to our associated Dr. B. C. Roy Hospital, Haldia were considered. The inclusion criteria of the anemic patients of both sexes was more than 18 years of age, non pregnant and premenopausal and hemoglobin concentration less than 12 g/dL in male and less than 10 g/dL in female. Patients of abnormal hemoglobin e.g. thalassemia and aplastic anemia, with acute and chronic infections, anemia due to blood loss or kidney problem, known alcoholism or cirrhosis of liver, regular (> 3 week) use of nonsteroidal antiinflammatory drugs (NSAIDs), known gastrointestinal or hematologic malignancy, etc. were excluded (Joharah, 2001) in this study.

Collection of blood sample

With all aseptic precaution, the whole blood of suspected anemic patients was collected in fasting condition by venipuncture using disposable syringes. A portion of the blood was used for determination of red blood cell (RBC) count, hemoglobin concentration, and the remaining portion of the blood was used for the determination of blood group.

Determination of total RBC count

The total erythrocyte count was done by hemocytometry using Neubauer's chamber with freshly prepared Hymes' diluting fluid (Ghai, 2007).

Determination of hemoglobin concentration

The ethylenediaminetetraacetic acid (EDTA) mixed blood was

considered to determine the hemoglobin concentration (g/dL) by the Drabkin's Cyanomethemoglobin method (Cook, 1985). The criteria for detecting anemia were diagnosed as per WHO guidelines (WHO, 2001).

Determination of blood group

The ABO blood group and Rhesus (Rh) factor of the anemic subjects were determined using the Tile or Slide testing method (Khattak et al., 2008) with the help of antisera-A, antisera-B and antisera-D and finally, the frequency of occurrence of anemia in relation to ABO blood group and Rh factor was assessed.

Statistical analysis

As per the standard protocol, the result was expressed as percentage which is considered as frequency distribution of each ABO blood group and Rh factor. To establish the relationship in between the blood group and anemia, the frequency distribution (observed frequency) of blood group among the entire anemic population (N=276) was compared with those of general non anemic population (N=1026) by Chi Square test (Mahajon, 2006).

RESULTS

In the present study, it is found that anemia is relatively prone to the individuals having blood group B, A or AB. It is also discovered that individuals with blood group O are comparatively resistant to anemia in spite of large frequency distribution of O groups in general population. Table 1 shows that the frequency distribution of O group is only 18% in anemic population, whereas it is far high (32%) in the general population. Statistical analysis by Chi square test reflects that the Chi square value at degree of freedom 3 is 10.18 which is far more than the 5% level of significance (0.05). Hence, the value is highly significant, that is, the frequency distribution of anemic group does not fit to the frequency distribution of non anemic general group or in otherwise, there is significant difference between the frequency distribution of anemic group and frequency distribution of non anemic general population. On the other hand, there is no such relationship between Rh factor and the occurrence of anemia is found between the above mentioned population.

DISCUSSION

Anemia is a global problem and at its worst in developing countries. Though oral supplementation of iron and vitamin B12 and folic acid are most commonly used as a therapeutic measure to correct anemia; it is suggested that the oral supplementation of iron is not the best way to correct anemia (especially which are not due to iron deficiency) especially due to its adverse affect on some other body functions for which the patients sufferings becomes worst. Under this situation, it is far better to take

the preventive measure to combat anemia by taking iron or vitamin rich diet, especially to those who are more prone to anemia; though the type of such population is not known to us. On the other hand, blood group is one of the important and comparatively known parameter to the large number of present population which exhibits a strong correlation with some common diseases like cardiovascular diseases (WHO, 1993), gastric cancer (Jennings et al., 1956; Yeoh, 1960) and even HIV infection (Abdulazeez et al., 2008). This study is thereby an attempt to explore any relationship between blood group antigens and anemia considering the aforementioned facts. This study reveals that there is strong correlation between blood group and anemia. The individuals with blood group antigen alpha and beta are comparatively more prone to be anemic, whereas the individuals devoid of these antigens are resistant to anemia. So, it can be concluded that the regular intake of iron and vitamin rich diet in individuals having blood groups A, B, and AB can prevent the occurrence of anemia.

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