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Does Non-ANC Influence Complications during delivery among Women in Slums in Greater Mumbai? .... page 3

From the Editor

Chief Editor:
A. Abyad
MD, MPH, AGSF, AFCHSE
Email: aabyad@cyberia.net.lb
Ethics Editor and Publisher
Lesley Pocock
medi+WORLD International
AUSTRALIA
Email:
lesleypocock@mediworld.com.au

Editorial enquiries:
aabyad@cyberia.net.lb

This is the third issue this year and we are planning a number of special issues this year including a special issue on development of family medicine in the region and another one on nursing care in cancer patients.

A paper from India uses primary data, collected using cluster sampling of sample size of 433 reproductive women who have given at least one live birth prior to survey on antenatal care, reproductive health problems during pregnancy and complications generated while child delivery from Rafi Nagar slum. The paper examines utilization of health services available to study women in slums in Mumbai and checks whether non-utilization of ANC and having reproductive health problems during pregnancy creates complications during child delivery on the basis of standard of living index constructed from household amenities. The findings using logistic regression reveals that those illiterate women did not go for ANC and having reproductive health problems during pregnancy, creates complications during child delivery. Besides, unimaginable low level of health utilization services was observed. This paper suggests that awareness is required at every stages of ANC, particularly to illiterate women for betterment of reproductive health during pregnancy.

A paper from Iraq attempted to determine whether co-infection of TORCH complex agents increased the development of bad obstetric outcome (BOH). The total number of women included in the study was 838, of them 547 were with BOH, and 291 were with normal pregnancy history. In the BOH group, 292 (53.4%) women were pregnant, while in the normal pregnancy group, 140 (48.1%) were pregnant. Parvovirus IgM and IgG were determined in 88 women (28 control, 20 inevitable abortion, and 40 BOH). IgG and IgM antibodies were detected in sera of all groups using ELISA method. The study showed that Co-infection was with high rate (77.8%) in our studied population. Ten pattern of co-infections were recognized, but the predominant one was rubella and CMV (42.5%). There was a significant frequency difference in seroprevalence of (T.gondii plus CMV, p=0.038), (T. gondi + rubella + CMV, p=0.001) and (Toxoplasma + HSV-2 + CMV, p=0.015) between women with BOH and control. Parvovirus Co-infections were significantly (p=0.000) different between BOH, inevitable abortion and control groups. The authors concluded that CMV, Parvovirus, Rubella, HV-2 and Toxoplasma co infections was a risk factor that increased development of BOH. CMV may play an important role as primary infection that lead to immunosuppression and enhancement of secondary pathogen infection.

A historical cohort study was conducted at Prince Rashid Ben Alhassan military hospital. The study looked at the association between low birth weight and dental caries of primary teeth among Jordanian children. A total of 127 children, who were born with LBW were orally examined and compared with 254 children who were born with normal birth weight (NBW) in relation to the count of teeth with decay, filling and missing because of decay (dmft index). They were retrospectively followed from birth to the period of conducting the study. There were no significant association was between LBW and dental caries. The authors concluded that the study don't support the presence of associations between LBW and dental caries. These results can be used as exploratory rather than as conclusive evidence. Although no significant association was found between LBW and dental caries; the possibility of the association between LBW and dental caries can't be excluded. A prospective study at a national level is recommended.

A paper from Saudi Arabia looked at Vitamin D Deficiency that is Comparatively More Prevalent in Female Children with Type 1 Diabetes in a High Vitamin D Deficiency Risk Country. The study comprised of 100 children with type-1 diabetes and 100 non-diabetics. Serum 25-hydroxy-vitamin D, PTH, total serum calcium, phosphate, and alkaline phosphatase, were measured. Age, gender, and duration of type 1 diabetes were accounted. Body mass index was also calculated. Out of 100 children 84 (84%) were vitamin D deficient (compared to control; 58%), defined as a 25-hydroxy-vitamin-D level below 50 nmol/L. The deficiency was found directly proportional to the age. Female children were showed higher prevalence of vitamin D deficiency compared to males (59%). Despite the high prevalence of vitamin D deficiency, we found a lower prevalence of secondary hyperparathyroidism in children and adolescents patients. The authors concluded that prevalence of vitamin D deficiency in diabetic children and adolescents is high. Females are significantly associated with the vitamin D deficiency. Therefore, screening for vitamin D deficiency in children and particularly in girls is recommended in the studied population.

A paper from Bagdad attempted to throw a light on the differences in knowledge and practices regarding dietary habits and healthy lifestyle among medical and non-medical students in Baghdad along with assessment of any perceived barriers. The author followed a cross-sectional study included 350 students from 6 colleges three medical and three non-medical colleges, in the period between 10th of February till 20th of May 2012.
It was found that the knowledge score of medical students was better(with 94.7% of the medical students scoring good>17versus52%) than non-medical students . Conversely the diet and lifestyle score (36- point scale) in medical students was poor (<27) in65.9% of them and in non-medical students was fair (27-31) in57.2% of the students. 'Lack of time' was cited as the most important reason for skipping meals and as a barrier to exercising regularly among both groups. It was concluded that The knowledge and practices of medical students in Baghdad suggest that superior knowledge about healthy lifestyle does not necessarily result into better practices.

Does Non-ANC Influence Complications during delivery among Women in Slums in Greater Mumbai?

V. M. Sarode

Correspondence:
Dr. V. M. Sarode
Associate Professor of Statistics,
Head, Department of Mathematics and Statistics,
Mulund College of Commerce,
Mulund (West), Mumbai - 400 080, India
Email: vijaymsarode@yahoo.com

Abstract

This study uses primary data, collected using cluster sampling of sample size of 433 reproductive women who have given at least one live birth prior to survey on antenatal care, reproductive health problems during pregnancy and complications generated during child delivery from Rafi Nagar slum. The paper examines utilization of health services available to study women in slums in Mumbai and checks whether non-utilization of ANC and having reproductive health problems during pregnancy creates complications during child delivery on the basis of standard of living index constructed from household amenities. The findings using logistic regression reveal that those illiterate women who did not go for ANC and having reproductive health problems during pregnancy, creates complications during child delivery. Besides, an unimaginable low level of health utilization services was observed. This paper suggests that awareness is required at every stage of ANC, particularly to illiterate women for betterment of reproductive health during pregnancy.

Key words: ANC; Reproductive health; Delivery Complications; Illiteracy; Mumbai Slums.

1. Introduction

Every seven minutes, one woman dies due to complications in pregnancy or child birth, in India (The Registrar-General of India, 2007). That's 77,000 deaths every year. This further attributes the high percentage of deaths to rundown maternity services and mother-and-childcare centers and rural health facilities. The current survey also reports that there are 300 maternal deaths per lakh (100,000) live births and what is most worrying is that women in the 20-24 age groups constitute one-third of the total deaths. The main causes for a majority of deaths are hemorrhage, puerperal sepsis (infections after delivery), complications of abortion, obstructed labor, and hypertensive disorders associated with pregnancy and lack of education and awareness (Registrar General of India, 2006). Most of the women are anemic because they don't take good care of themselves. Inadequate health care and child birth in quick succession are the other issues. Abortions done by dais and quacks, which is widely prevalent in India, could also give rise to various infections.

In the poorest parts of the world, the risk of a woman dying as a result of pregnancy or childbirth during her lifetime is about one in six compared with about one in 30,000 in Northern Europe. India, being a developing country, contributes to 26% of the global burden of maternal deaths with nearly 136,000 women dying annually (UNICEF, 2009) due to causes related to pregnancy and childbirth. Such a discrepancy poses a huge challenge to meeting the fifth Millennium Development Goal to reduce maternal mortality by 75% between 1990 and 2015 (Carine, 2006). It has also been estimated that for every maternal death, there are over 100 acute morbid episodes, indicating an overall figure of 62 million maternal morbidities annually (Koblinsky, 1993). This invites the attention of researchers to examine

the causes and epidemiological factors associated with maternal deaths.

Antenatal care provides a preventive service that monitors pregnancy for signs of complications, detects and treats pre-existing and concurrent problems of pregnancy, and provides advice and counseling on preventive care, diet during pregnancy, delivery care, postnatal care and related issues thus to reduce maternal morbidity and mortality if delivered effectively. However, the success that it has in achieving this aim is related to the quality of service that is provided, the number of visits that a women receives during pregnancy, the timing of those visits and the existence of and accessibility of professional delivery care when necessary (World Health Organization, 1996b).

In 1996, safe motherhood and child health services were incorporated into the Reproductive and Child Health (RCH) Programme in India. This program recommends that as part of antenatal care, women receive two doses of tetanus toxoid vaccine, adequate amounts of iron and folic acid tablets (90+) or syrup to prevent and treat anaemia, and at least three antenatal check-ups that include blood pressure checks and other procedures to detect pregnancy complications (Harrison, 1990; Ministry of Health and Family Welfare, 1997; 1998b)

Maharashtra, the state of India, has the highest number of slum dwellers (Nandita et al., 2002) having a slum population of more than 40 million (Census of India 2001). The study conducted (Godbole and Talwalkar, 1999) in urban slums in Maharashtra (excluding Greater Mumbai) showed that the antenatal care coverage for three or more ante-natal check-ups was 55 per cent for women in slums. About 58 per cent of women in slums were reported to have taken a complete dose of iron and folic tablets and only 34 per cent of women reported a birth interval of more than three years in slum areas. Anemia is an underlying cause for a range of morbidities and severe anemia is a cause of maternal mortality. The consequences of anemia are severe, long term and often irreversible. A study (Khilare 2001) conducted in the slum area of Pimpri-Chinchwad area of Pune district indicated that out of a total of 1,797 women registered for antenatal care at the PCMC Bhosari hospital, about 83 per cent were anemic (hb < 11 gms/dl). The proportion of anemic pregnant women increased to 89.6 per cent for unrecognized slums.

Another study done (Jean, 2008) in a slum in Nairobi where access to appropriate facilities is limited, women with no formal education, availed less appropriate health facilities. Uneducated women, not seeking delivery care at a proper facility are more likely to have pregnancy complications in the later stage of pregnancy. Besides women who delivered at a health facility indicated that more than 75% of women who delivered at appropriate facilities had at least one complication during delivery compared with about 66% among those who delivered at inappropriate facilities ($p < 0.01$).

The study done in slum areas of Dhaka, Bangladesh, women who delivered in facilities (both elective and emergency transfers) were of significantly higher economic status, were better educated, and were significantly more likely to have received antenatal care than women who gave birth at home. There were no significant differences in parity, nutritional status, anemia, or serious delivery-related complications between those who delivered at home and those who delivered at elected facility. Emergency transfers, however, were more likely than deliveries at home or at an elective facility among “primipara” (odds ratio [OR]=1.9; $p<0.01$,) and among those who met the operational definitions for serious delivery-related complications (OR=3.4; $p<0.01$). This study also showed that the self-reported postpartum morbidity was associated with maternal characteristics, delivery-related complications, and some birthing practices (Fronczak et al, 2007).

A study (Mayank et al., 2001) of women in the slums of Delhi, India reports that among women who experienced bleeding during pregnancy, 44 per cent actually recognized it as a danger signal; of those experiencing high blood pressure, and swelling of the hands, face and feet, only 33 per cent and 9 per cent respectively, recognized its severity. Indeed, this study concludes that although the vast majority of pregnant women received antenatal care, fewer than 10 per cent had been informed about danger signals.

In Andhra Pradesh, Madhya Pradesh and Orissa, states of India, women who did not seek care for complications experienced during pregnancy cited lack of mobility and lack of resources as reasons while those who did not seek care for complications experienced in the postpartum stage cited lack of resources as the reason (Murthy and Barua, 2001).

A research study conducted by the Institute of Health Management, Pachod (IHMP) in 27 slums of Pune, India, indicates that women suffer from much preventable morbidity. Post-abortion complications are reported in 42 per cent of the cases. As many as 44 per cent of women from urban slums did not seek treatment for reproductive tract infections. Data also indicate that 68 per cent of women harbour negative gender attitudes against themselves - a result of the process of socialisation. These attitudes have a direct impact on their treatment-seeking behaviour and utilisation of antenatal services (Kapadia-Kundu and Tupe 2001).

It has also been ascertained that pregnancy-related problems have far-reaching consequences on the overall reproductive health of women, in addition to their contribution to maternal mortality (Bhatia Cleland, 1995a). Besides less attention has been paid on pregnancy related problems and treatment to these problems. Gynecological morbidity has been studied at community level to a certain extent (Bang et al, 1989, Bhatia Cleland, 1995b, Parikh et al,

1996, Prakasam, 2004) but study on pregnancy related problems and complications while delivery is scanty. Recently, a few studies have been conducted mainly to explore the prevalence of obstetric morbidity at the community level (Bhatia et al 1996: Srinivasa et al, 1997), but negligible attempts were made to examine the determinants of obstetric morbidity among women in slums. Women, particularly in the poor socio-economic status have the inherent tendency of late reporting of morbidity episodes, which subsequently worsens the intensity of health disorders and co-morbidities (Harikrishnan, 2009).

In general, women in slums remain unaware of their own reproductive health problems that occur during pregnancy such as Danger sign for pregnancy, Excessive bleeding, Anaemia, diet care during pregnancy and Blood pressure check etc. Further risk is involved in repeated pregnancies and proper utilization of antenatal and postnatal care is another concern. Hence it is necessary to impart knowledge about pregnancy related problems and to understand the root causes of generating complications during delivery among such poor women in slums. Besides, women in the urban slums are unaware of the existing health facilities and even though these facilities are available, they have not been adequately utilized.

Thus, keeping in view the above research work, an attempt is made, to evolve a suitable strategy for knowing **i)** the reproductive health of a study of women during pregnancy,
ii) utilization of antenatal care among study women and **iii)** the determinants influencing complications during delivery among women in slums in the area of Greater Mumbai, this study has been initiated.

Footnotes

a. Mumbai was selected for the trial, in view of presence of large urban lum population (highest among cities in Maharashtra). Situation analysis of the slums revealed existence of unlisted slums, pockets of underserved slum population and underutilization of existing health services.
b. The indexed women were the ones who had a live birth during the last 3years preceding the survey.
c. Based on this survey, the information was recorded as self reported symptoms. This did not necessarily imply check up being carried out at the time of survey.
d. Complete Antenatal Care for a pregnant mother includes at least 3 antenatal check-ups, 2 doses of TT injection and consumption of 90+ IFA tablets prior to the expected date of delivery.
e. An antenatal check-up includes weight and height measurement, blood pressure, abdominal examination and diagnostic tests including urine test etc.

2. Background of the study area

According to a UNESCO document, “a slum is a building, a group of buildings, or area characterized by overcrowding, deterioration, unsanitary conditions or absence of facilities, or amenities which, because of these conditions or any of them, endanger the health, safety or morals of its inhabitants or the community (Anderson N., 1960). “Slums may be characterized as areas of substandard housing condition within a city. A slum is always an area. A single, neglected building even in the worst stage of deterioration does not make a slum” (Bergel E. E., 1955). Apart from these definitions, a slum is an area of darkness, an area of poverty and thus poverty is the prime characteristic of a slum.

The TFR for slum areas of Mumbai is 2.69. Within Mumbai, the proportion of births of order one is 35 and that of order four or higher in slum areas is 18 percent. Short birth intervals may adversely affect a mother’s health and her children’s chances of survival. Besides, the percentages who want at least one son (sex preference) are 76 percent, and who want at least one daughter is 72 percent. Infant mortality rate in slum areas is 28 (per 1000 born).

Picture 1: Profile of the study area

Likewise, Rafi Nagar, a densely populated slum, situated at Deonar, comes under M/E ward of Brihan Mumbai Municipal Corporation, Mumbai, is about 4 kms away from Govandi railway station, a suburb in the eastern part of Mumbai, India. This ward spreads over 34.38 sq. km. and has an overall population density of 27,398 per sq. km. Deonar is at the third rank position as far as slum area populations in Mumbai are concerned. In Deonar, out of 6.72 lacs of people, 5.22 lacs of people stay in the slum area (population density - 19,546 per sq. km.). The

Picture 2: Environmental condition in study area.

slum sex ratio of M/East ward is 785. The female literacy rate is 67.49 as compared to male literacy rate of 82.9 which is quite below the national level (Census of India, 2001, Maharashtra population data with data on slum population in urban units).

Rafi nagar which is next to the Shivaji nagar, is one km. away from Govandi (West) railway station, is another straw ling slum on the south separated by 120 feet of road. On the north of Rafinagar is BMC's dumping ground. On the East is Shivaji nagar BEST depot and West side it has a 30 feet wide nullah. This slum area spreads over approx 0.30 sq. km. having about 1000 zopadis (huts) and has about 5500 residents. Most of the inhabitants are migrants from the states of Utter Pradesh, Bihar, West Bangal, some southern parts of India including interior part of Maharashtra. The majority of huts are kachha, semi-pucca and very few pucca.

Rafi nagar slum was formed in the year 1970 with a tenement size of 20. Normally, 4-5 families come together and then occupy such open land, a so called, 'dumping ground' which is being used by municipal corporations for accumulating garbage. Such group of families start living on such grounds by erecting 4 bamboos on four sides separated by 6-10 feet making an area of about 60-100 sq ft, and then they cover it with plastic sheets, thus forms 'Zopadi' (hut) such huts are called as kachha house. When many such huts are constructed adjacent to each other it becomes a congested locality.

The Rafi nagar is also of the same type where the huts are congested; it has an area ranging from 60 sq. ft. to 100 sq. ft. and in rare cases more than 100 sq. ft. It was found that 8-10 family members used to reside in a single room of house. Drinking water facility was found to be very poor in this area.

Sanitation is also very poor in the study area. Slum dwellers use common toilet located in the study area or otherwise they prefer the locations of 30 ft. wide nallah. As there is no proper drainage system in the study area, dirty gutters formed automatically while washing utensils and clothing just outside the house. Children also use these gutters for toilet purposes and as there is no sufficient common ground to play, children play near this gutter. This leads to the communicable diseases like diarrhea, cough with fever etc. As, many people stay in the small room which has hardly ventilation with no sufficient sunlight, no sufficient water even for bathing and also for toilet, many members of such family always feels like sick and thus household of the family hesitate to go to a job.

The environmental conditions in the slum are very dirty; dirty smell is one of the characteristics of this area. Living together in a congested room with unhygienic atmosphere having contaminated drinking water may leads to the diseases like T.B., Malaria, and Asthma etc.

It was also found that the residents of this area cannot afford good medical facilities, hygienic food, and reasonable sanitation as they are extremely poor. For the health services they prefer nearby Sub-Urban Health Centre located in the Lotus colony which is adjacent to the Shivaji nagar area and for the major ailments, they prefer to go to the Urban Health Centre (UHC) adopted by Nair Hospital, where a full-fledged team of doctors and para-medical staff serve the community.

It was also found that, many times the slum dwellers, particularly, study women don't avail a medical facility

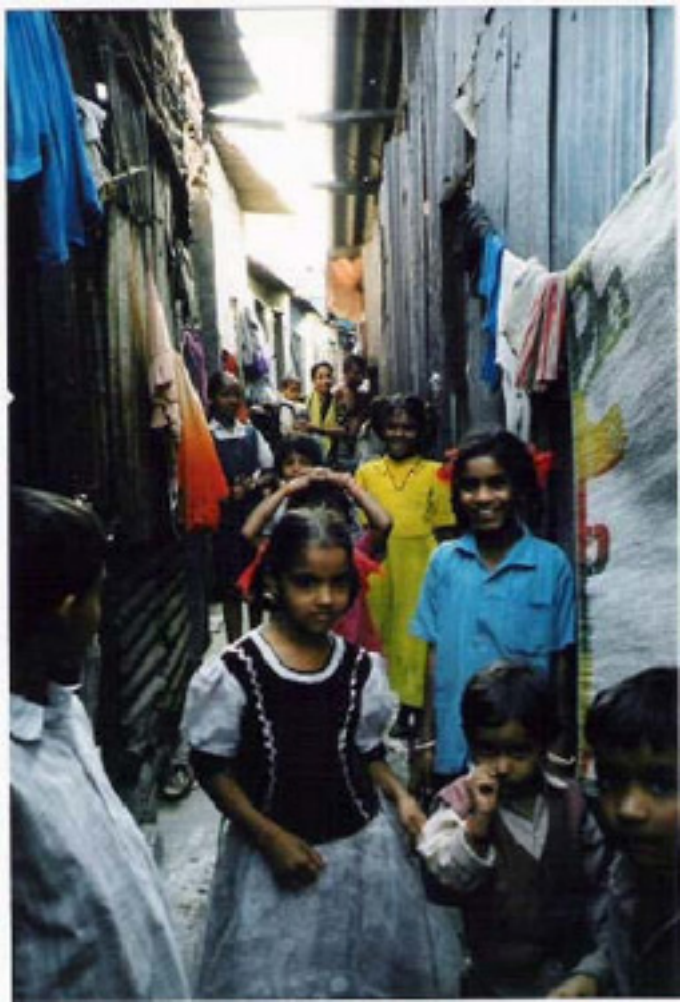
Picture 3: Housing condition in the study area

until the disease take its own shape. The reason is that they have to spend a small portion of money in buying the medicines as prescribed by the doctors (as the mother wants to spend this money for their family), but she does avail the same for her children. 'Shatapdi' hospital, run by Municipal Corporation is generally used for delivering a child and for ANC they go to UHC but a tendency of study women for regular Post Natal Check-ups was rarely seen.

It was also observed that many study women prefer to deliver their child at home. It was also observed that, quite a number of study women avail the medical treatment either from UHC or from private hospital for their reproductive health problems. Community health volunteers (CHV) used to provide essential medical facilities to the slum dwellers, particularly to the pregnant women during ANC and PNC periods in the study area. It was also observed that the respondents were found to be very frank with the investigators who were undergraduate/ graduate girls to whom full training was given and their doubts were discussed and solved with resident's doctors from UHC.

In short, the life of the residents was found to be very measurable having imposed congested houses, shortage of drinking water with unhygienic toilet facility, polluted and dirty smelling atmosphere. Besides, the study women were reluctant to take availing treatment for their reproductive health problems during pregnancy including ANC, Child delivery, PNC and even child immunization.

The present study was conducted in Rafi nagar where the population of this slum was 5500.



Picture 4: Lane in the study area

3. Materials and Methods

i) Measuring household standard of living

In the absence of data on income and consumption measures, household standard of living indices are often constructed using three sets of information, namely source of drinking water, Toilet facility, type of house and ownership of selected consumer durables (Montgomery et al., 2000). Index scores for the present study ranges from 1-6 for a low SLI to 7-9 for a medium SLI and >=10 for a high SLI (Appendix). There are three other approaches in the construction of living of standard indices differing in the manner in which different household amenities, quality of housing materials, and assets are weighted.

ii) Data

For the present investigation, two stage sampling procedure has been adopted. In the first stage, the slums in the Greater Mumbai according to their population size were listed using the "Directory of Slums" published by office of the additional collector (ENC), Mumbai & Mumbai Sub. Dist. (see ref.). Two lists were prepared,

one for plain area slums and another for hilly area slums. From each list, one slum was selected at random. Hence the slum selected from plain area was Rafi Nagar slum in Deonar. The population of this slum (study area) was 5500 respectively.

In the second stage of sampling, from the study areas, using cluster sampling, two clusters were selected at random. From these, two clusters, 433 households were selected. The respondents were interviewed carefully using structured schedule by the trained investigators who generally work with the doctors in Pulse-Polio campaign. In all, this study covers 433 reproductive women in slums representing the slum population in Greater Mumbai. This survey was conducted from June to August, 2005. Before going for survey, a pilot survey was also conducted.

In order to know the reproductive health of study women during pregnancy, utilization of antenatal care among study women and the determinants influencing complications during delivery among the study women in the reproductive age groups in slums in Mumbai, the children born to mothers during the last three years prior to survey, were considered.

4. Results and Discussion

i) Reproductive Health Problems during Pregnancy

Figure 1 shows the problems during pregnancy reported by study women. About 45 percent of the women in the study area reported that they had at least one problem during pregnancy. The major antenatal problems reported were excessive fatigue 45 percent (NFHS-2: 49.1 percent), followed by excessive vomiting 22 percent, swelling of the legs 25 percent (NFHS-2: 35.9 percent), pain in abdomen 39 percent, white discharge 41 percent, blurred vision 19 percent (NFHS-2: 12.1 percent), any vaginal bleeding 14 percent (NFHS-2: 3.5 percent), convulsion not from fever 13 percent (NFHS-2: 10.5 percent), night blindness 25 percent (NFHS-2 and RCH: 6.3 percent), and anemia 3 percent (NFHS-2: 16.1 percent). The percentage of these pregnancy problems remains almost the same as compared to the problems specially shown as Mumbai slum data in NFHS-2 for Maharashtra state where a survey was taken in 1998-99. This indicates that even after a decade, the reproductive health condition of study women living in this slum remains poor; probably these women are not utilizing the medical facilities available in that area.

ii) Antenatal Care

Women not receiving antenatal check-ups tend to be disproportionately older women, women of high parity,

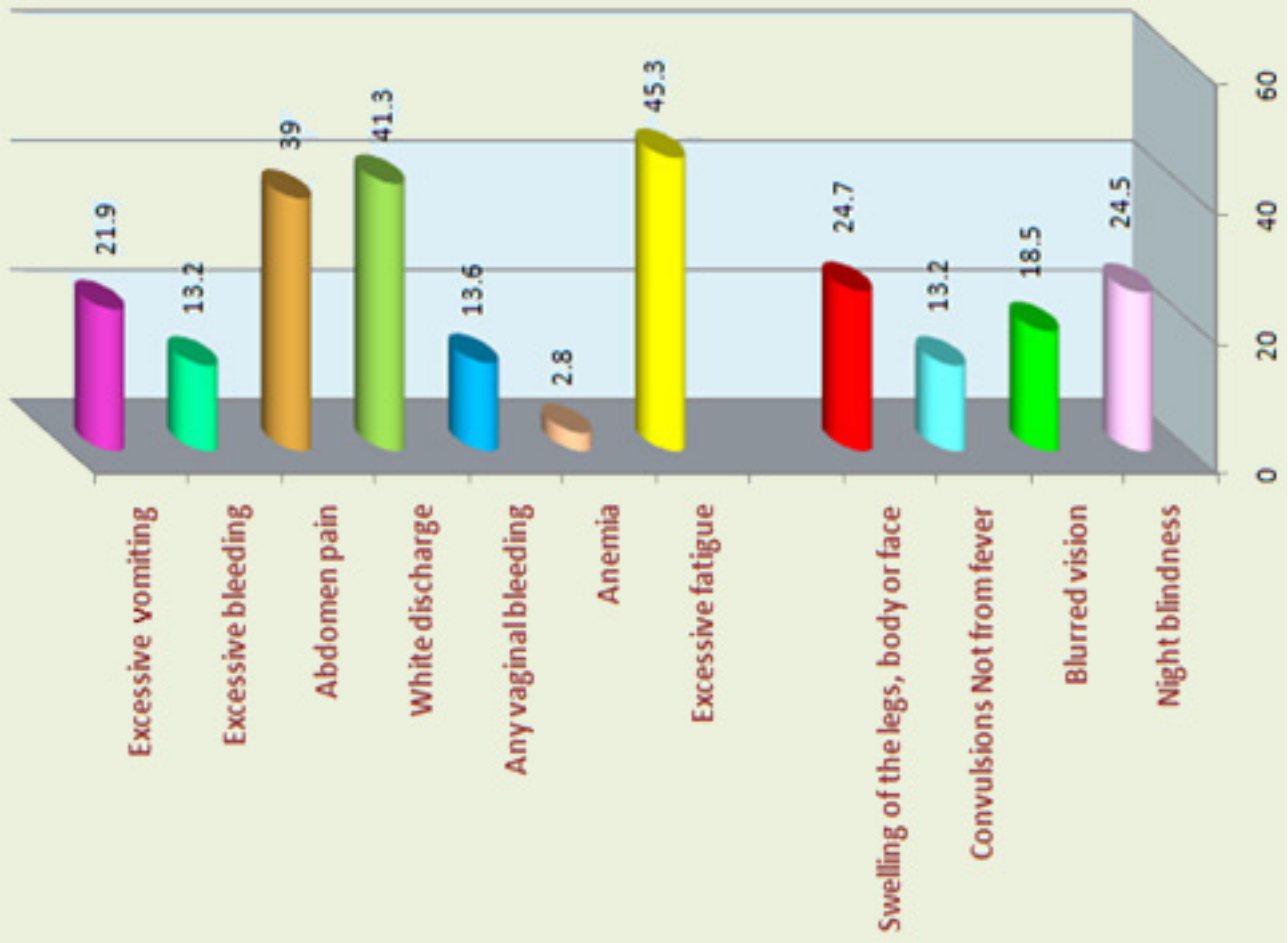


Figure 1: Utilization of Antenatal Care Services showing Problems during Pregnancy in Rafi Nagar Slum, Deonar, Mumbai, India.

women from scheduled Tribes, illiterate women and women from households with a low standard of living. Antenatal care is essential for ensuring safe motherhood. During the antenatal period, women are likely to face health problems of a reproductive nature and there will be a package of measures available for expectant mothers, which ensures safe motherhood. The study women who have given at least one live birth during the last three years prior to survey in the study area were considered to analyze the differentials in pregnancy problems experienced by mothers and the extent of utilization of antenatal care services.

a) Components of Antenatal Care Indicators

Table 1.1 indicates that 83 percent of study women received at least one antenatal check-up, 52 percent received three or more antenatal check-ups, 69 percent received two or more T.T. injections and 92 percent have consumed iron and Folic acid tablets or syrup. Median number of check-ups (for those who received at least one antenatal check-up) was 1, and 17 percent of study women did not go for antenatal check-ups.

b) Components of Antenatal Check-ups:

Antenatal Measurements / Tests

Data on various components of antenatal check-ups underwent by women in Table 1.2 shows positive behavior pattern of women in utilizing antenatal care services in the study area. Weight measured is only 61 percent, blood and urine test, 78 and 75 percent respectively, Sonogram and abdomen is 64 and 71 percent respectively and even blood check-up 78 percent.

c) Antenatal Advice

Data on antenatal care advice in Table 1.3 reveals that the proportion of pregnant women in the study area have not utilized proper advice on delivery care since danger sign for pregnancy is only 11 percent, newborn care is just 55 percent followed by special diet 53 percent and family planning is about 49 percent and even use of tobacco during the pregnancy is quite high, about 30 percent.

Thus from the tables it can be summarised that still 17 percent of women did not avail antenatal check-ups. Figure 1, Table 1.1 and Table 1.2 show not that good MCH service performance. Data on antenatal care advice in Table 1.3 reveals that the proportion of pregnant women in the study area have not utilized proper advice on delivery care as new born care is just 55 percent followed by special diet and family planning is about 49 percent. Hence the study reveals not that good antenatal care seeking behavior of women towards antenatal measurements, besides too moderate towards antenatal advice.

5. Socio-Economic Correlates

Table 2 (page 12) shows the influence of the socio-economic characteristics of study women on the utilization of antenatal care services in the study area. It is clearly seen from the table that the utilization of

Antenatal care indicators:	Rafi Nagar Slum, Deonar	
	Total cases	Percent of cases
Percentage who received at least one antenatal check-up	360	83.1
Percentage who received three or more antenatal check-up	226	52.2
Percentage who received two or more T.T. injections	247	68.8
Percentage given any iron and Folic acid tablets or syrup	331	91.9
Tablets received/purchased		
1-40	131	30.3
41-100	47	14.2
100+	42	12.7
Not received	29	8.1
Median number of check-ups (for those who received at least one antenatal check-up)	1	
No antenatal check-ups	73	16.9

Table 1.1: Utilization of Antenatal Care Services showing Antenatal Care Indicators during pregnancy in Rafi Nagar slum, Deonar, Mumbai

Components of Antenatal check-ups	Rafi Nagar Slum, Deonar	
Antenatal measurements / tests	Cases	
	Yes	Per
Weight measured	265	61.2
Height measured	196	45.3
Blood pressure checkup	310	71.6
Blood test	338	78.1
Urine test	326	75.3
Abdomen Examined	308	71.1
X-Ray	79	18.2
Sonogram/Ultras	276	63.7
Any other test	79	18.2

Table 1.2: Utilization of Antenatal Care Services showing Components of Antenatal Check-ups in Rafi Nagar slum, Deonar, Mumbai.

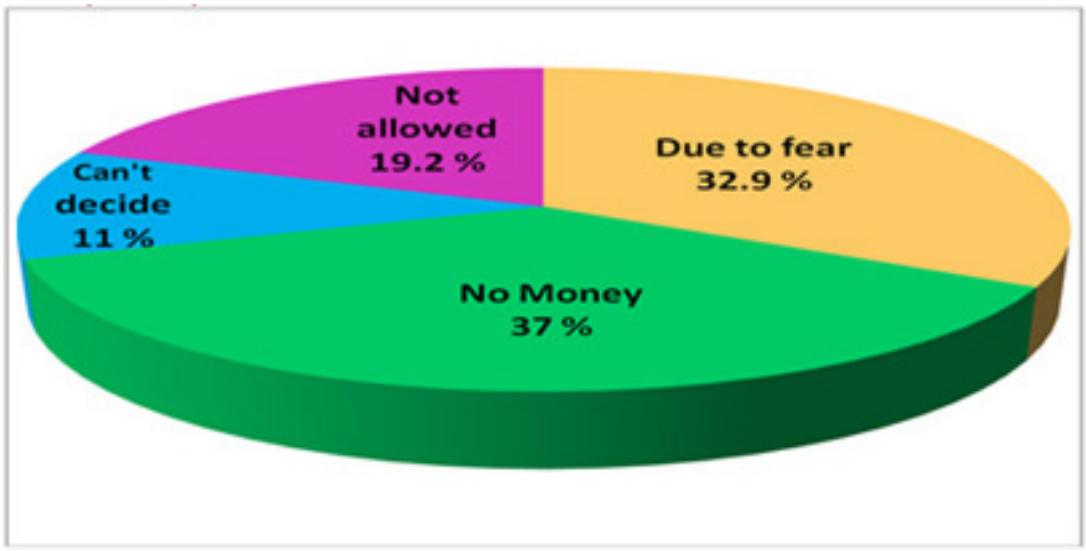


Figure 2: Reason for not receiving an antenatal check-up according to residence, Rafi nagar slum area, Deonar, Mumbai.

Antenatal advice	Cases	
	Yes	Per
Special diet	231	53.3
Danger sign for pregnancy	46	10.6
Delivery care	240	55.4
New born care	237	54.7
Family planning	212	49.0
Use of any form of tobacco	128	29.6
Walking exercise	255	58.9
Number of births for which the mother received at least one antenatal checkup	573	

Table 1.3: Utilization of Antenatal Care Services showing Antenatal Advice in Rafi Nagar slum, Deonar, Mumbai.

Background characteristics	Rafi Nagar Slum, Deonar		
	Received antenatal checkup		Number of Births
Mother's age	Yes	Percent	
15-24	131	86.2	199
25-29	115	81.6	193
30-49	114	81.4	181
Total			573
Birth order			
1	55	87.3	64
2	71	85.5	105
3	75	85.2	123
4+	159	79.9	281
Mother's education			
Illiterate	224	78.6	394
Literate, <middle school complete(1-6)	64	88.9	88
Middle school complete and above(7+)	72	94.7	91
Religion			
Hindu and Other	23	88.5	33
Muslims	337	82.8	540
Caste			
SC, ST	35	85.4	52
Other	325	82.9	521
Standard of living			
Low	131	86.2	206
Medium	149	81.0	242
High	80	82.5	125
Total	360	-	573

Table 2: Percentage received antenatal care by selected background characteristics in Rafi Nagar slum, Deonar, Mumbai||

antenatal care services increases with rise in the position of women with respect to each of the socioeconomic factors. The utilization of antenatal care services decreases with rise in the birth order of children and rise in mother's age whereas it increases with improvement in the position of women with respect to education. The utilization of antenatal care services was found less among Muslims compared with the Hindu. It shows no fixed pattern in the case of 'caste' and 'SLI' category. There is a very negligible difference in seeking ANC services by the background variables, which indicates that besides socio-economic factors, some other non background factors have been responsible for splendid performance of antenatal care services in the Rafi nagar slum area of Deonar.

In order to see the net effects of independent variables (description of the variables is provided in Table 3 (opposite page) for Rafi nagar slum area) on the dependent variable which is dichotomous, logistic regression technique has been adopted.

6. Determinants of Utilization Of Health Care Services During Delivery Period (Delivery Complications): A Logistic Regression Analysis

Logistic Regression

Table 4a (page 14) shows the influence of the reproductive health problems during pregnancy of study women who did not go for ANC on delivery complications in the study area. It is clearly seen from the table that delivery complications due to Any vaginal bleeding and Excessive bleeding were 63 percent, followed by Convulsions Not from fever (56%), Anemia (50%), Blurred vision (49%), White discharge and Excessive fatigue (47%), Swelling of the legs, body or face (45%) and for rest it was around 43%.

The logistic regression results in Table 4b (page 14)reveals that the study women who have not gone for antenatal care and have pregnancy problems results in complications during the delivery. Here the dependent variable is complications at the time of delivery and the independent variables were problems during the pregnancy and study women who did not go for ANC. The results of logistic regression showed that **Swelling of the legs, body or face, Any vaginal bleeding, White discharge and Excessive bleeding** during pregnancy will influence complications during the delivery of the respondents from Rafi nagar area.

7. Conclusion and Policy Implications

Maternal deaths are clustered around labour, delivery, and the immediate postpartum period, with obstetric haemorrhage being the main medical cause of death. Skilled attendance during delivery, access to emergency obstetric care and postnatal care (PNC) are cost effective and life saving investments for mothers. The extent of services available and availed during complications related to pregnancy, delivery and postpartum indicates the state of obstetric morbidity and mortality (Ministry of Health and Family, 2008).

Category	Variables	code
	Dependent variables	
Delivery complications	No (Ref)	0
	Yes	1
	Independent variables	
1. Night blindness	No (Ref)	0
	Yes	1
2. Blurred vision	No (Ref)	0
	Yes	1
3. Convulsions Not from fever	No (Ref)	0
	Yes	1
4. Swelling of the legs, body or face	No (Ref)	0
	Yes	1
5. Excessive fatigue	No (Ref)	0
	Yes	1
6. Anemia	No (Ref)	0
	Yes	1
7. Any vaginal bleeding	No (Ref)	0
	Yes	1
8. White discharge	No (Ref)	0
	Yes	1
9. Abdomen pain	No (Ref)	0
	Yes	1
10. Excessive bleeding	No (Ref)	0
	Yes	1
11. Excessive vomiting	No (Ref)	0
	Yes	1
Utilisation of antenatal care service (ANC)	Antenatal Care service not utilized (Ref)	0
	Antenatal Care service utilized	1

Table 3: Measurement of variables used in the logistic regression analysis for Rafi nagar slum area, Deonar

This data showed that the extent of utilization of services pertaining to the antenatal period are excellent other than for illiterate women, low category SLI women, SC-ST, OBC women. The roll of socio-economic factors in service utilization is clearly evident in study area. It clearly shows that as education level increases, the utilization of ANC also increases. This study also reveals excellent antenatal care seeking behaviour of women towards antenatal measurements but moderate towards antenatal advice. About 21 percent of illiterate women and 14 percent of women from low category of standard of living are not availing themselves of delivery care services; clearly indicates that there is a concentration of women amongst the poorest of the economic stratum who go without adequate maternal care.

Similarly the influence of reproductive health problems during the pregnancy women having no ANC creates complications during delivery and the most influencing factors found were **Swelling of the legs, body or face, any vaginal bleeding, White discharge and excessive bleeding.**

Even if community health volunteers (CHV) play big role in communicating importance of ANC, delivery care and post-natal care to the expectant women and to avail the health facilities in this area, illiteracy and poverty prevents such women from utilizing health facilities.

	Delivery complication	
Problems during pregnancy:	Yes	Percent
Night blindness	46	43.4
Blurred vision	39	48.8
Convulsions Not from fever	32	56.1
Swelling of the legs, body or face	48	44.9
Excessive fatigue	93	47.4
Anemia	6	50.0
Any vaginal bleeding	37	62.7
White discharge	84	46.9
Abdomen pain	77	45.6
Excessive bleeding	36	63.2
Excessive vomiting	37	38.9
ANC	119	33.1

Table 4a: Percentage reproductive health problems during pregnancy and ANC on delivery complications in Rafi Nagar Slum, Deonar, Mumbai

	Sig.	Odds ratio
Problems during pregnancy		
Night blindness	.751	1.110
Blurred vision	1.000	1.000
Convulsions Not from fever	.840	1.054
Swelling of the legs, body or face	.011	1.782**
Excessive fatigue	.813	1.182
Anemia	.200	1.362
Any vaginal bleeding	.056	1.892*
White discharge	.009	2.407***
Abdomen pain	.359	1.252
Excessive bleeding	.018	2.281**
Excessive vomiting	.254	.732
ANC	.000	.339***
Constant	.147	.650
-2 Log likelihood	507.465	
Cox and Snell R^2	0.140	
Nagelkerke R^2	0.190	
Number of births	414	

***p<0.01 , **P<0.05, *P<0.10

Table 4b: Odds ratios from logistic regression examining the effect of antenatal care and reproductive health problems during pregnancy on delivery complications in Rafi Nagar Slum, Deonar, Mumbai

Appendix

The standard of living is calculated by adding the following scores:
Type of House: 4 for pucca, 2 for semi-pucca, 0 for kachha;
Toilet facility: 4 for own flush, 2 for public, 1 for public pit or open, 0 for no facility;
Source of lighting: 2 for electricity, 1 for other, 0 for no facility

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Thus this paper suggests that

- the effective awareness campaign through urban health centers,
- committed health workers,
- easy access to services,
- awareness among study women related to the birth interval, proper diet during pregnancy
- better health care delivery system,
- quality health care,
- Follow-up care etc is needed for the betterment of reproductive health of women in such slums particularly the illiterates.

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Toxoplasma gondii, Rubella and Cytomegalovirus Co-infections as risk factors for Abnormal Pregnancy Outcomes

Abdulghani Mohamed Alsamarai (1,2)
Hala Mohamed Majeed Hassan (3,4)
Ferah Ghali Alsalihi (5)
Amina Hamed Alobaidi (6)
Zainab Khalil Mohamed Aljumaili *(7)*

(1) Departments of Medicine and Microbiology,
Tikrit University College of Medicine, Tikrit, Iraq
(2) Asthma, Allergy Centre, Tikrit Teaching Hospital, Tikrit, Iraq;
(3) Department of Microbiology, Tikrit University College of Science, Tikrit, Iraq
(4) College of Veterinary Medicine;
(5) Department of Biology, College of Science,
(6) Department of Biochemistry, Tikrit University College of Medicine, Tikrit,
(7) Kirkuk Health Authority, Iraq.

Correspondence:
Abdulghani Mohamed Alsamarai
Departments of Medicine and Microbiology
Tikrit University College of Medicine
Tikrit, Iraq
Email: galsamarrai@yahoo.com, galsamarrai@hotmail.com

Abstract

Background: Viral invading of host cell may lead to immunosuppression and subsequently enhance secondary infection by other Infectious pathogens.

Aim: To determine whether co-infection of TORCH complex agents increase the development of bad obstetric outcome (BOH).

Patients and methods: The total number of women included in the study was 838; of them 547 had BOH, and 291 had normal pregnancy history. In the BOH group, 292 (53.4%) women were pregnant, while in the normal pregnancy group, 140 (48.1%) were pregnant. Parvovirus IgM and IgG were determined in 88 women (28 controls, 20 inevitable abortion, and 40 BOH). IgG and IgM antibodies were detected in sera of all groups using ELISA method.

Results: Co-infection had a high rate (77.8%) in our studied population. Ten patterns of co-infections were recognized, but the predominant one was rubella and CMV (42.5%). There was a significant frequency difference in seroprevalence of (T.gondii plus CMV, p=0.038), (T. gondi + rubella + CMV, p=0.001) and (Toxoplasma + HSV-2 + CMV, p=0.015) between women with BOH and control group. Parvovirus co-infections were significantly (p=0.000) different between BOH, inevitable abortion and control groups. In addition, there was a significant difference in mixed parvovirus infection between BOH versus control; non-pregnant BOH versus non-pregnant control; and abortion versus normal pregnancy. Furthermore, the frequency of parvovirus mixed infections were significantly more frequent (p=0.000) in women with BOH (88.3%) compared to control (25%). CMV with other agents was the predominant (77%) mixed infection, followed by parvovirus with others (68.2%) and rubella with others (66.7%). Rubella with others and parvovirus with others were with significant differences between women with BOH and control.

Conclusion: CMV, Parvovirus, Rubella, HV-2 and Toxoplasma coinfections was a risk factor that increased development of BOH. CMV may play an important role as primary infection that leads to immunosuppression and enhancement of secondary pathogen infection.

Key words: TORCH, IgG, IgM, Toxoplasma, rubella, CMV, HSV, BOH, coinfection

Introduction

Bad obstetric history (BOH) implies previous unfavorable fetal outcome [1]]. Maternal infection is one of the common etiology of BOH worldwide [2-6]. Although there was general agreement on the role of infections in development of BOH, different global studies presented wide disparities in seroprevalence of organisms implicated as cause of BOH [7]. However, some of the reported studies did not indicate a significant difference in seroprevalence of the infectious agents between BOH and control women group [6,7].

Some gynecologists do not believe that there is a role of infectious agents, such as cytomegalovirus, in development of BOH. Their belief was dependent on the seroprevalence of non significant difference between women with BOH and those without.

Infectious pathogens are one of the causal agents for secondary immunosuppression and acquired immunosuppression due to pathogens is primarily caused by viruses that invade the cellular compartment of the immune system [8]. Viruses induce immunosuppression by a variety of mechanisms [9]. Immunosuppression may result from direct effects of viral replication on lymphocytes functions and this effect may be selective on subtypes or all classes of lymphocytes [9]. In addition, virus infected cells release soluble materials which may lead to immunosuppression or macrophage function disturbances due to direct viral infection to macrophage. Furthermore, viral infections may trigger an imbalance in immune regulation characterised by over activity of suppressor cells [9]. During natural rubella infection, at the time of rash appearance, mitogens activation of lymphocytes was reduced. In addition, rubella infections lead to a reduction in helper lymphocyte and increase in suppressor cells number [10]. These mechanisms may act collectively in a synergistic fashion to induce immunosuppression. Cytomegalovirus (CMV) is associated with sustained general immunosuppression of the host [11,12]. Reported studies indicated that TNF dependent release of arachidonic acid and PGE2 contribute to CMV-induced immunosuppression [12]. Furthermore, CMV interferes with signal transduction pathways in T-cell [13].

Toxoplasma gondii infection may induce immunosuppression through immunomodulation of the immune response [14]. Under the influence of INF-?, nitrogen monoxide is capable of reducing lymphocyte proliferation [15], the same is true for IL-10 [16]. Toxoplasma proteins, such as surface antigen 1 and microneme proteins directly control the above changes [17]. However, this immunosuppression is only exerted on the splenic and mesenteric lymphocytes [18]. Reduction of the production of IL-12 by dendritic cells and increase in the production of IL-10 is reported to occur during the course of toxoplasma infection [19]. These immunosuppressant mechanisms induced during toxoplasma infection, prevent the development of type 1 immunopathological phenomena [20]. This ensures the survival of the host, but also that of toxoplasma gondii [14]. Thus we hypothesized that infection with either one of Toxoplasma gondii, CMV or rubella may trigger the infection with others or CMV may act as immunosuppressor which may lead to superinfection with the other microbe. The aim of the present study was to determine whether co-infection of TORCH complex agents increased the development of bad obstetric outcome.

Patients and Methods

Study design:

This descriptive case-control study included women (Pregnant or Non pregnant) with a bad obstetric history or without. The study population had an age range of 15 to 48 years (mean age 28.42) and they were recruited from Kirkuk General Hospital and Primary Health care Centres located in Kirkuk Governorate. In addition, one of the study population groups was recruited from pregnant women who had just aborted.

Inclusion & Exclusion criteria:

The study population was recruited using a predesigned, pretested schedule of inclusion and exclusion criteria. Other causes of foetal loss were excluded by performing clinical examination and laboratory investigations. All subjects included in the study were interviewed to gather demographic and clinical information.

Ethical approval:

The study design was approved by the ethical committee of Tikrit University College of Medicine and informed consent was taken from each woman included in the study.

Study Population:

The total number of women included in the study was 838; of these 547 had BOH, and 291 had normal pregnancy history. In the BOH group, 292 (53.4%) women were pregnant, while the corresponding value in the normal pregnancy group was 140 (48.1%).

There were no significant differences in mean age among all the groups and subgroups. (Table 1 - top of page 18). The study population was divided into two groups, women with BOH and women without, as control group and these two groups were subdivided into pregnant and non pregnant.

Methods:

ELISA was used for determination of IgM and IgG for Toxoplasma, Rubella, CMV, HSV-2 and Parvovirus. The test was performed according to manufacturer instructions. The kit was purchased from BioCheck, Inc, 323 Vintage Park Dr, Foster City, CA 94404. The test results were read by Microwell reader at 450 nm on an ELISA reader.

Analysis of data:

Chi squared test was used for comparison between the groups and was employed using the SPSS (Version 16).

Group		Number	Mean age ± SD in years
Women with bad obstetric history	Pregnant	292	28.35 ± 7.25
	Non pregnant	255	28.24 ± 6.81
	Total	547	
Women with normal pregnancy	Pregnant	140	27.40 ± 6.24
	Non pregnant	151	28.06 ± 10.51
	Total	291	
Grand total		838	28.42 ± 7.72
P value	ANOVA	NS	

Table 1: Study population

Co-infection trend	Number	Percent	
		Total tested	Total mixed infection
Rubella+ CMV	277	33.1	42.5
Toxoplasma + Rubella + CMV	114	13.6	17.5
Rubella + CMV + HSV-2	107	12.8	16.4
HSV -2 + CMV	69	8.2	10.6
Toxoplasma + Rubella + CMV + HSV-2	59	7.04	9.0
Toxoplasma + HSV-2 + CMV	11	1.3	1.7
Toxoplasma + CMV	8	0.95	1.23
Rubella + Toxoplasma	5	0.6	0.77
HSV-2 + Toxoplasma	1	0.12	0.15
Toxoplasma + Rubella +HSV-2	1	0.12	0.15
Total	652	77.8	100

Table 2: TORCH Co-infection Trends

Co-infection trend	Number [Percent]		X^2	P value
	BOH (547)	Control (291)		
Rubella+ CMV	189 [34.6]	88 [30.0]	1.61	NS
Rubella + Toxoplasma	4 [0.73]	1 [0.34]	0.48	NS
Toxoplasma + CMV	8 [1.46]	0 [0]	4.30	**0.038**
HSV -2 + CMV	41 [7.5]	28 [9.6]	1.14	NS
HSV-2 + Toxoplasma	1 [0.2]	0 [0]	0.53	NS
Toxoplasma + Rubella + CMV	59 [10.8]	55 [18.9]	10.6	**0.001**
Rubella + CMV + HSV-2	69 [12.6]	38 [13.1]	0.03	NS
Toxoplasma + Rubella +HSV-2	0 [0]	1 [0.34]	0.53	NS
Toxoplasma + HSV-2 + CMV	11[2.0]	0 [0]	5.93	**0.015**
Toxoplasma + Rubella + CMV + HSV-2	35 [6.4]	24 [8.2]	0.99	NS
Total	417 [76.2]	235 [80.7]	2.25	NS

Table 3: Comparison of Co-infections Trends between BOH and Control

The study finding data are presented as frequency ± SD and 95% Confidence Interval.

Results

The overall co-infection rate was high (652/838, 77.8%) in the studied population. The predominant co-infection was (rubella with CMV), which formed 33.1% of the tested samples (42.5% of Co-infection), followed by (Toxoplasma, rubella with CMV) (17.5%) and (Rubella, CMV with HSV-2) (16.6%). In addition, (CMV with HSV-2) co-infections formed 10.6% and (Toxoplasma, rubella, CMV with HSV-2) formed 9%, Table 2.

Comparison of co-infection rate between women with BOH and those without indicated a significant difference in (Toxoplasma with CMV) co-infection (X2=4.3,p=0.038), Toxoplasma, rubella with CMV co-infection (X2=10.6,p=0.001), and Toxoplasma, HSV-2 with CMV co-infection (X2=5.93,p=0.015), Table 3.

Parvovirus mixed infection with TORCH agents are shown in Table 4 (next page). There was a significant frequency difference (X2=38.3,ANOVA; P=0.000) in seroprevalence of parvovirus co-infection with others between BOH, control and abortion groups. In addition, parvovirus co-infection was significantly higher (X2=35.3,p=0.000) in women with BOH as compared to the controls. Furthermore, parvovirus co-infection was significantly (X2=30.1,p=0.000) higher in BOH non pregnant (90%) women than in control non pregnant (0%) women. However, parvovirus co-infection was higher in BOH pregnant women (80%) than control pregnant (50%) women, but the difference did not reach significant level.

Comparison of parvovirus co-infection in women with BOH to those with normal pregnancy outcome indicated a 6 trends of co-infections with higher rate in BOH women. A significant difference was demonstrated between BOH and control women in [(Parvovirus+rubella+CMV), X2 =4.24,p=0.04], and [(Parvovirus+CMV), X2=4.67,p=0.031)], Table 5.

CMV with others was the predominant trend (645/838, 77%) of co-infection, followed by Parvovirus with others (60/88, 68.2%) and rubella with others (559/838, 66.7%). The lowest rate was for Toxoplasma with others (189/838, 22.6%) co-infection trend, Table 6. Comparison between BOH and control women show significant differences for rubella with others (X2=3.94,p=0.047) and Parvovirus with others (X2=35.3,p=0.000), Table 7.

Discussion

The present study indicated a high rate (77.8%) of co-infection in women of childbearing age and the most common trend was rubella with CMV (33.1%). In addition, the present study indicated a significant frequency difference in seroprevalence of co-infection trends such as Toxoplasma with CMV (X2=4.3, P=0.038), and Toxoplasma +HSV-2 + CMV (X2=5.93, P=0.015). Thus from the present study data we conclude that mixed (co-infection) had significant impact for development of BOH rather than single infection alone.

As reported previously [21], in subjects with T. gondii infections there was a higher rate of association with CMV and HSV-1 infections. Our findings indicated that T. gondii IgG antibodies were positively associated with the presence of rubella IgG, and CMV IgG (13.6%), and in 7.04 with rubella, CMV and HSV-2 IgG seropositivity.

Transmission of CMV was promoted by poor socioeconomic conditions that are characterised by overcrowding and lack of personal hygiene, and children placed in day care.[22]. Reported studies indicated an association between T. gondi infection and low socioeconomic status [23-25], which may explain why individuals with CMV seropositivity were likely seropositive for toxoplasma [21]. Furthermore, rubella and CMV co-infections were significantly more predominant in women with BOH (34.6%) than in those with normal pregnancy (30%).

Parvovirus, rubella with CMV was a co-infection trend that was significantly higher (X2=4.24, P=0.04) in women with BOH as compared to those without. In addition, there was a significant difference in mixed parvovirus infection with others between women with BOH, inevitable abortion and control group.

The immune response to infectious agents is a complicated phenomenon usually characterised by rapid production of specific antibodies and activation of cell mediated immunity. On the other hand, suppression of the immune system has been shown to occur in many viral infections, which in turn can expose the individual to diseases caused by other infectious agents [27]. Three previous studies in Qatar (T. gondii, CMV and HSV-1), Turkey (CMV, HCV, EBV and rubella) and Iraq (Toxoplasma, rubella, and CMV) reported coinfections [21,28,2], Zainab 2013] in childbearing age women. The present and these three studies pointed out new trends in infections in women during pregnancy, which may be able to lead to more complicated pregnancy outcomes.

The present study finding postulated a hypothesis that infection with a single virus induced an immunosuppression which subsequently enhanced invasion by other microorganisms. Reported studies observed immunological depression during infectious mononucleosis, varicella, measles, and CMV infections, and after rubella vaccination [29-32]. The definite reason for the suppression as well as the general regulatory events of the immune response is still not well understood. Cytomegalovirus infection induces immunosuppression [33,34], and subsequently is associated with high incidence of microbial infections [35]. This immunosuppressive phenomenon may be a character of infection with toxoplasma, rubella, HSV-2 and parvovirus.

Group [Number]		Number [Percent]		
Bad obstetric history	Pregnant [20]	16 [80]		
	Non- pregnant [20]	18 [90]		
	X^2	2.06		
	P value	NS		
	Total [40]	35 [87.5]		
Control	Pregnant [14]	7 [50.0]		
	Non- pregnant [14]	0 [0.0]		
	X^2	9.33		
	P value	0.002		
	Total [28]	7 [25]		
Abortion	Inevitable [20]	19 [95]		
			X^2	P
P	BOH, Abortion and Control		38.3	0.000
	Pregnant BOH versus Normal pregnancy		3.39	NS
	Non- pregnant BOH versus Non-pregnant normal pregnancy		30.1	**0.000**
	BOH versus Normal pregnant		8.44	**0.004**
	Abortion versus BOH		0.83	NS
	Abortion versus Normal pregnancy		23.0	**0.000**

Table 4: Parvovirus Mixed Infection with others [TORCH]

Infection Trend	BOH (60) Number [Percent]	Control (28) Number [Percent]	X^2	P
Parvovirus	0 [0.0]	19 [67.8]	51.9	**0.000**
Parvovirus + Rubella + CMV	24 [40.0]	5 [17.8]	4.24	**0.040**
Parvovirus + CMV	13 [21.7]	1 [3.6]	4.67	**0.031**
Parvovirus + Rubella	7 [11.7]	1 [3.6]	1.51	NS
Parvovirus + Toxoplasma + Rubella + CMV	4 [6.7]	0 [0.0]	1.96	NS
Parvovirus + Toxoplasma + Rubella	3 [5.0]	0 [0.0]	1.45	NS
Parvovirus + Toxoplasma + CMV	2 [3.3]	0 [0.0]	0.95	NS
Total parvovirus co-infections	53 [88.3]	7 [25.0]	35.3	**0.000**
Other co-infections	4 [6.7]	0 [0.0]	1.96	NS
Total co-infections	57 [95.0]	7 [25.0]	47.2	NS
Negative	3 [5.0]	2 [7.1]	0.16	NS

Table 5: Frequency of Parvovirus and TORCH Co-infections Trends

Co-infection trends	Number positive / Number tested	Percent
CMV with others	645/838	77
Parvovirus with others	60/88	68.2
Rubella with others	559/838	66.7
HSV-2 with others	248/838	29.6
Toxoplasma with others	189/838	22.6

Table 6: Trends of Co-infections in women of childbearing age

Co-infection trend	Number [Percent]		X^2	P value
	BOH (547)	Control (291)		
Toxoplasma with others	118 [21.6]	71 [24.4]	0.87	NS
Rubella with others	352 [64.4]	207 [70.4]	3.94	**0.047**
CMV with others	412 [75.3]	233 [80.1]	2.14	NS
HSV-2 with others	157 [28.7]	91 [31.3]	0.60	NS
Parvovirus with others	53 [88.3]†	7 [25.0]#	35.3	**0.000**

Table 7: Comparison of Co-infections Trends between BOH and Normal Pregnancy Outcomes

Acute CMV infection is associated with sustained general immunosuppressant activity to the host as demonstrated in CMV mononucleosis with impaired cell mediated immunity [36]. The peripheral blood lymphocytes from these patients exhibit a diminished proliferative response to mitogens and herpes virus antigens with a reversal of CD4/CD8 cell ratio. This has been attributed to an increase in CD8 positive cells [36]. CMV infected monocytes (MO) in vitro were reported to be more suppressive when compared to uninfected MO for autologus lymphocyte responses to concanvalin A [37]. It has been suggested that in vivo MO may act as a reservoir for CMV replication and dissemination [38].

The mechanism(s) underlying CMV-mediated immunosuppression are unclear. CMV infection in vitro has been shown to affect cellular activation pathways of human fibroblasts. CMV was reported to induce the hydrolysis of phosphatidyl inositol 4, 5 biphosphate (PIP2), Ca 2+ influx, and an increase in intracellular free Ca2+, as well as increased cellular levels of cAMP and cGMP [39], and arachidonic acid (AA) metabolism [40,41]. More recently, it has been reported that CMV affects transmembrane signaling pathways in CD4-positive T-lymphocytes. CMV enhanced HIV replication in T cells is via a cAMP and protein kinase C-dependent pathway [13].

In a previous study, it was demonstrated that CMV infection of human MO in vitro was associated with enhanced TNFa production that induced the release of AA and PGE 2. The latter inhibited T-cell activity, which might partially account for the immunosuppressive effects characteristic of CMV. The phase of CMV expression responsible for the induction of AA release was consistent with the conditions associated with CMV immediate early gene expression [12]. Furthermore, CMV encoded Interleukin-10 has the ability to induce immunosuppression, CMV evade of immune system, proinflammatory cytokines synthesis reduction [11]. In addition, major histocompatibility complex (MHC) class I and II molecules expression was reduced, while in contrast, non-classical MHC allele HLA-G and subvert NK cell activity expression were increased [11].

The gene products (US2,US3,US6,US11) interfere with antigen processing and presentation, resulting in reduced MHC class I presentation [42]. In addition, a homology of the potent immune modulator interleukin -10 (IL-10) was discovered in the genome of human CMV [43]. Spencer et al [11] suggest that CMV IL-10 has the capacity to impair the proliferation of a wide range of cell types that play a role in viral immune response.

In a recently reported study [27], experimental CMV infection diminishes the CD8 response to heterologous virus infection and therefore latent CMV infection resulted in pronounced changes of the T-cell component consistent with impaired naïve T-cell function.

Numerous clinical studies showed that CMV seropositivity coincides with poor responses to other viruses [44], poor responses to vaccines [45], or poor life expectancy in the very old [46-48]. All the above mechanisms could explain the induction of immunosuppression by CMV infection. This assumption may be strengthened by the reported findings of re-infections by CMV and HSV in healthy seroimmune individuals [49,50].

Rubella infections decreased lymphocyte blast transformation, capable of infecting human leukocytes, and consequences of regulatory T-cells activity [51]. In addition, Hyypia et al [10] suggested that in rubella infection, there was suppressor to helper T cells imbalance which is due to increased proportion of T cells with suppressor/cytotoxic phenotype and decreased proportion of cells with helper/inducer phenotypes. The above mentioned mechanisms that induced following CMV and rubella infections tend to accentuate the immunosuppression and may lead to co-infection or reactivation of T. gondii, HSV-2 and/or parvovirus. The present study finding goes with such assumption as parvovirus co-infection with rubella and CMV was significantly higher (X2=4.24, P=0.04) in women with BOH as compared to control.

CMV forms with others the predominant seropositive (77%) co-infection, while rubella was the second common seroprevalence. However, rubella seroprevalence was mainly not due to natural infection but due to vaccination programs. Thus CMV was the leading natural infection in our study population, based on the present study data, we propose a model for bad obstetric outcome (BOO). In this model persistent CMV infection causes ongoing immunosuppressive effects that enhance secondary infection in pregnant women, which may lead to increase of pregnancy adverse outcomes. Parvovirus was the commonest secondary invaders, followed by HSV-2 and toxoplasma, if we exclude rubella as its high seropositivity was due to vaccination. The CMV induced immunosuppression could be influenced by pollution as this study indicated a significant higher CMV in smokers. In addition, Kirkuk population may have a high prevalence of immune risk profile associated with CMV infection.

In conclusion, TORCH complex agent's coinfections were a risk factor that increased development of abnormal pregnancy outcomes and CMV primary infection may be the leader that induces immunosuppression and subsequent secondary microbial infection and increased development of pregnancy adverse outcome.

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The association between low birth weight and dental caries of primary teeth among Jordanian children

Tarek Athamneh (1)
Ziad Al-Shraideh (1)
Tamador Fahmi Malkawi (1)
Mohannad Yousef Ersan (1)
Ala Ersheidat (2)

(1) Specialist, Department of Obstetrics and Gynecology, Royal Medical Services.
(2) Specialist, Department of Dentist, Royal Medical Services.

Correspondence:
Dr. Ahmad Bani Salameh
Department of Medicine
Royal Medical Services
Email: mkateeb@lycos.com

Abstract

Objective: To determine the association between low birth weight and dental caries of primary dentition of 381 children aged 30-48 months.

Design and method: A historical cohort study was conducted at Prince Rashid Ben Alhassan military hospital. A total of 127 children, who were born with LBW were orally examined and compared with 254 children who were born with normal birth weight (NBW) in relation to the count of teeth with decay, filling and missing because of decay (dmft index). They were retrospectively followed from birth to the period of conducting the study.

Results: No significant association was found between LBW and dental caries. Cox regression in the multivariate analyses showed that hazard ratio (HR) for the association between LBW and dental caries is 0.995, 95% confidence interval (CI): 0.67, 1.49, p=0.981.

Conclusion: The study didn't support the presence of associations between LBW and dental caries. These results can be used as exploratory rather than as conclusive evidence. Although no significant association was found between LBW and dental caries; the possibility of the association between LBW and dental caries can't be excluded. A prospective study at a national level is recommended.

Key words: Hypertension, prevalence, risk factors.

Introduction

Low birth weight (LBW) is defined as a birth weight of a live born infant of less than 2,500 g (5.5 pounds) regardless of gestational age. It is of public health importance, because of the strong relationship between birth weight and infant mortality and morbidity and chronic diseases later in life(1,2). Globally, it has been estimated that about 15.5% of newborns are born with low birth weight (LBW) in 2000, and the rate in developing countries (16.5%) was more than double that of developed countries (7.0%)(3).

LBW children are at increased risk for having health problems during the childhood period. The relationship between LBW and dental conditions has not received much attention, because of the scarcity of the studies that have been attempted to evaluate this relationship. Most of the studies showed that there is association between LBW and enamel defects and a reverse linear relationship between the first deciduous tooth eruption and birth weight which will lead to the delayed eruption of the primary teeth(4). However, their results were based on very limited evidence; therefore they couldn't reject the possibility that there is a link between LBW and subsequent development of caries.

Dental caries are prevalent among Jordanian children. One study showed that 67% of the 4-5 year old Jordanian children have dental caries(5). Studies have shown that not all children are at equal risk for developing caries (4-6). Identifying high risk groups of children may help to develop better interventions to control caries. Therefore, this study was conducted to determine the association between dental caries of primary dentition and low birth weight among Jordanian children aged between 30 and 48 months.

Patients and Methods

A historical cohort study was conducted at Prince Rashid Ben Alhassan military hospital from May 2010 to June 2011. The study was approved by the ethics committee and informed written consent from all participants was obtained. All children born with birth weight less than 2500 grams and aged 30-48 months at the time of the study and registered in maternal and child health program were included.

Of the 1850 newborn registered in that period; 150 were born with LBW and were included in the study as the exposed group. Children were excluded if it was impossible to contact their parents by telephone or letter, if the child was with special need, or had any medical problem or with congenital deformities that may affect caries experience. Parents or care givers were contacted by the researcher through telephone, or invitation letter given to their relatives who visited the health centre.

All consecutive NBW children who attended to the health centre (as routine visits for growth monitoring, vaccination, or as patients) during the study period, were referred to the researcher to be included in the study. Non-exposed children were enrolled in the study consecutively until the sample size was reached. Children were excluded if the child had fever, any major illness, if the child had special needs or any systemic disease or any congenital deformity that may affect caries experience. These criteria left 127 subjects with birth weights 700g - 2450 g to be included in the analysis.

Data Collection

Data related to the child's characteristics at birth such as child birth weight, gestational age, congenital deformities, and pregnancy complications were abstracted from the child and maternal health records. Additional information was obtained from parents/guardians of children by face to face interview using a structured questionnaire.

The questionnaire was divided into five sections: The first section collected data about the child including gender, age, birth weight, twins, current weight, current height, presence of congenital deformities, chronic diseases, and the use of any medication. The second section included information about the family and socio-demographic characteristics including mother's age, family monthly income, place of living, parent's educational level, parent's employment status, consanguinity between parents, number of living children, familial diseases, parent's smoking habits.

Other sections included data about the prenatal period such as prenatal maternal anemia, gestational hypertension, gestational diabetes, hemorrhage, or any other pregnancy complication, gestational age, type of delivery, and frequency of antenatal visits were included. Other sections included other data such as breastfeeding, bottle feeding, age of introducing complimentary food, sweet intake, number of daily meals, frequency of fizzy drinks intake, and oral hygiene habits. Current height and weight were measured for every child by a trained nurse.

Dental Examination

The main outcome of this study was the presence of dental caries, which was measured by decayed teeth, teeth missing because of caries, filled (dmft) index. The visual and tactile inspection took place in the dental clinic. The tooth was considered decayed (d) if there was a lesion in pit or fissure, or smooth tooth surface with an unmistakable cavity, or detectable softened floor or wall (explorer catch), or undermined enamel. Clinical assessment of dental caries was done by Dentition status and treatment needs (WHO Oral Health Assessment Form, 1997).

Statistical Analysis

Data was coded and entered using Statistical Package for Social Sciences (SPSS, version 17) software and then statistical analysis was done. Bivariate analysis was performed when comparing the two groups in their caries experience; ages of the children in the study sample were classified into two sub groups: 30-39.9 months, and 40-48 months. That was to reduce the effect of confounding effect of age; as it is one of the principal risk determinants of dental caries. The comparison of the socio-demographic, medical, feeding, diet practices and oral hygiene practices for the two groups NBW, LBW were done using univariate analysis tested by Pearson Chi square test for categorical variables, and t test when comparing means of the continuous variables; dmft index, age, current weight, and current height. Cox regression analysis was used to test the association controlling for the potential confounders found in the univariate analyses.

Results

This study included 381 children (254 NBW and 127 LBW) with a mean (SD) age of 37.6 (5.6) month. Table 1 (next page) shows the characteristics of children according to birth weight. Fathers of NBW children were more likely to have higher educational level compared to those of LBW children (p-value<0.005). About one third (37.8%) of LBW children and 20.9 % of NBW children were delivered by cesarean section (p-value=0.002).

Dental caries according to children's characteristics

Figure 1 (page 27) shows the incidence of dental caries according to birth weight for children aged 30-39 months and 40-48 months. About one third (38.3%) of the LBW children aged 30-39 months, and 27.7% of the NBW children of the same age group had at least one decayed tooth (P=0.125). On the other hand, 66% of the LBW children aged between 40 and 48 months and 55.6% of the NBW children of the same age group had at least one decayed tooth (p=0.211).

Table 1: Characteristics of children according to birth weight

Variable	Normal birth weight (NBW) n (%)	Low birth weight (LBW) n (%)	P-value
Gender of the child			0.772
Boy	124 (48.8)	60 (47.2)	
Girl	130 (51.2)	67 (52.8)	
Mother's Age (year)			0.096
< 30	153 (53.1)	56 (44.1)	
≥ 30	119 (46.9)	71 (55.9)	
Mother's education			0.942
< high school	119 (46.9)	59 (46.5)	
≥ high school	135 (53.1)	68 (53.5)	
Mother's occupation			0.488
Employed	17 (6.7)	11 (8.9)	
Unemployed	237 (93.3)	116 (91.3)	
Father's occupation			0.052
Employed	240 (94.5)	113 (89.0)	
Unemployed	14 (05.5)	14 (11.0)	
Father's education			*<0.005*
< high school	99 (39.0)	76 (59.8)	
≥ high school	155 (61.0)	51 (40.2)	
Family monthly income (JD*)			0.279
<200	78 (30.7)	46 (36.2)	
≥ 200	176 (69.3)	81 (63.8)	
Place of living			0.751
Inside camp	180 (70.9)	88 (69.3)	
Outside camp	74 (29.1)	39 (30.7)	

JD; Jordanian dinar. JD =0.71 US$

Dental caries was significantly associated with gender and hypoplasia. The incidence of dental caries was significantly higher in girls compared to boys (71.2% vs. 49.3%, p-value=0.007) in the age group of 40-48 months. In the same age group, 55.2% of children who had no hypoplasia and 87.0% of children who had at least one tooth with hypoplasia had at least one decayed tooth (p-value= 0.004). In the age group 30-39 months, about 28.2% of children who had no hypoplasia and 48.1% of those who had at least one hypoplastic tooth had at least one decayed tooth (p-value= 0.034). None of the variables including parent's characteristics, feeding pattern, duration of breastfeeding, duration of bottle feeding, number of daily meals, having fizzy drinks regularly and teeth brushing was significantly associated with dental caries in both age groups.

Multivariate analysis

In the univariate Cox proportional hazard analysis, dental caries was not significantly associated with LBW (HR=1.001, 95% confidence interval (CI) 0.73, 1.37, (p =0.99)). In multivariate Cox proportional hazard analysis (Table 3), birth weight was not significantly associated with dental caries (HR=0.99, 95%CI: 0.67, 1.49, p= 0.981) after adjusting for all variables in Table 2. None of the studied variables were significantly associated with dental caries.

Discussion

At the population level, the proportion of babies with a LBW is an indicator of a multifaceted public-health problem that includes long-term maternal malnutrition, ill health, hard work and poor health care in pregnancy. On an individual basis, LBW is an important predictor of newborn health and survival and is associated with higher risk of infant and childhood mortality(6).

Table 2. Univariate Cox regression analysis of factors associated with dental caries

Independent variable	Hazard ratio	95% confidence interval	p- value
Birth weight			
Normal BW	0.99	0.67, 1.49	0.981
Low BW	1.00		
Gender			
Male	1.00		0.275
Female	1.20	0.86, 1.67	
Income			
<200 JD	1.11	0.79, 1.58	0.542
≥200 JD	1.00		
Gestational age			
Full term	0.62	0.32, 1.22	0.167
Preterm	1.00		
Mother age			
<30 year	1.00	0.72, 1.41	0.996
≥30 year	1.00		
Anemic mother			
Yes	1.00		
No	0.77	0.54, 1.11	0.161
Hypoplasia			
Yes	1.07	0.67, 1.69	0.788
No	1.00		
Feeding			
Breastfeeding	0.95	0.61, 1.47	0.891
Bottle feeding	1.19	0.50, 2.82	0.668
Number of meals			
1-2	0.90	0.61, 1.47	0.594
>2	1.00		
Daily sweet intake			
1-2	1.95	0.84, 3.04	0.158
>3	1.98	0.95, 4.12	0.070
Fizzy drinks			
Yes	1.00		
No	0.84	0.57, 1.23	0.361
Teeth brushing			
No brushing	1.00		
<once daily	0.78	0.44, 1.37	0.384
Once daily	0.87	0.51, 1.49	0.624
Twice daily	1.23	0.74, 2.04	0.424

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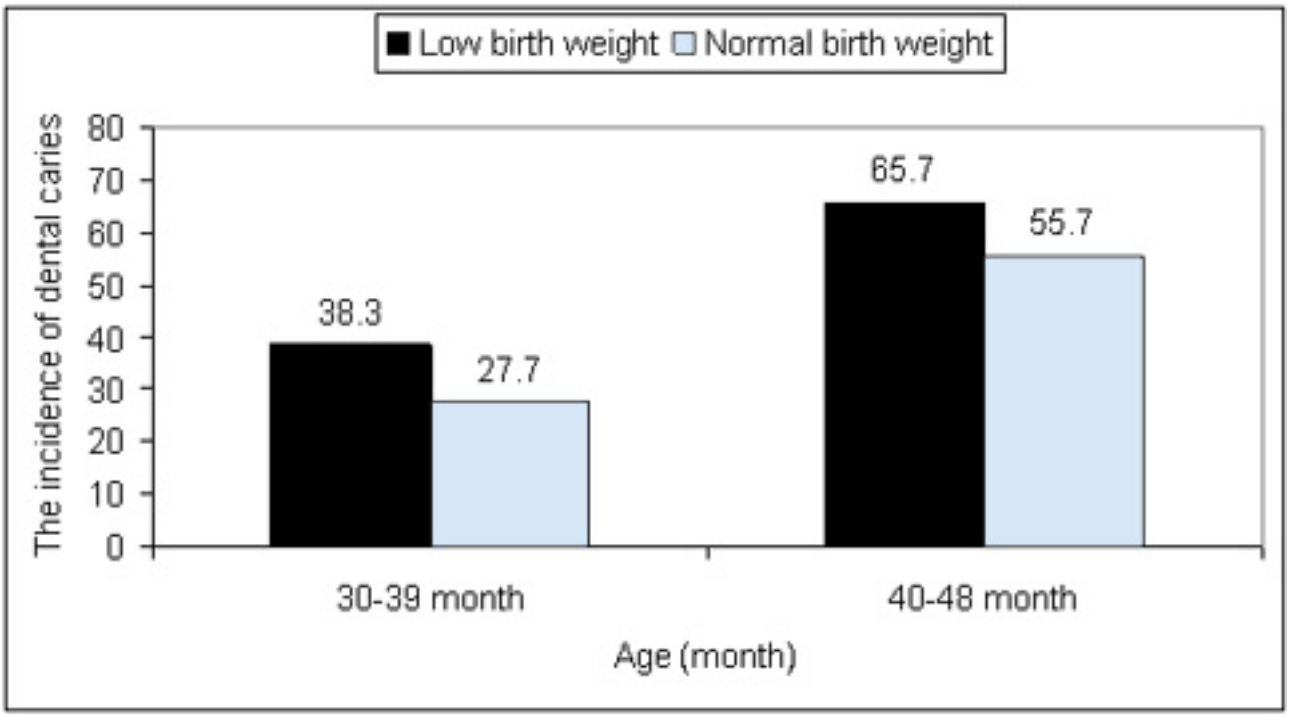
Figure 1: The incidence of dental caries according birth weight for children aged 30-39 months and 40-48 months



The fact that dental caries is a multifactorial disease, some risk groups have been identified, and attention should be focused on them so that preventive and health promotion measures are taken in an attempt to reverse this situation. One of these risk groups is composed of children born prematurely(7).

This study showed that there is no significant association between LBW and dental caries in primary teeth. This finding is consistent with the results of most of researchers who failed to support this association(8,9). On the other hand, Nelson et al(10) claimed that LBW was a significant risk factor for increased enamel defects in the permanent incisors and first molars. However, one study(11) found a negative association between prematurity and dental caries in children aged less than 3 years; however the finding was limited by the small sample sizes and insufficient power.

For the lower immunity that was reported to be associated with LBW, this might expose LBW children in the sample to more frequent antibiotic medications, which could halt the colonization of streptococcus mutans and protect LBW children from being at a higher risk. The preventive effect of antibiotic for teeth decay was suggested in the systematic review conducted by Waxman et al, who reported that five of the six studies demonstrated significant defensive effects of childhood antibiotics to caries progress, whereas one study illustrated questionable results(12).

Moreover, in spite of the strong association between hypoplasia and streptococcus mutans counts(13); the significant association between hypoplasia and dental caries in the bivariate analyses wasn't proven after doing adjustment in the multivariate analyses. This would explain why the significant association between hypoplasia with LBW, didn't lead to an association between LBW and dental caries. This result was reported by Lai et al.; which concluded that in spite of the high prevalence of enamel defects in VLBW children in their sample there was no significant increase in caries prevalence among them compared with those with NBW(14).

Shulman also stated the absence of association between the two conditions, but he reported that there were limitations concerning data collected from NHANES III dataset, such as validity of data for some covariates were limited in some states, in addition to the absence of information concerning fluoride exposure of the children in the sample(15). Saraiva et al studied the earlier data collected from NHANES III dataset; they concluded the same as Shulman, however there were limitations in their study(16).

Conclusion

In conclusion, this study doesn't support the presence of associations between LBW and dental caries. These results can be used as exploratory rather than as conclusive evidence. Although no significant association was found between LBW and dental caries; the possibility of the association between LBW and dental caries can't be excluded. A prospective study at a national level is recommended.

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Vitamin D Deficiency is Comparatively More Prevalent in Female Children with Type 1 Diabetes in a High Vitamin D Deficiency Risk Country

Fatimah Alshamsan (1)
Eman Elgabry (2)
Bassam Bin-Abbas (2)

(1) Department of Food Science and Nutrition,
College of Food and Agricultural Sciences, King Saud University
(2) Department of Pediatrics, Security Forces Hospital, Riyadh, Saudi Arabia.

Correspondence:
Fatimah M Ashamsan
Department of Food Science and Nutrition
College of Food and Agricultural Sciences, King Saud University
P. O Box. 3172, Riyadh- 14253, Saudi Arabia
Tel No. +966 558850708
Email: falshamsan@ksu.edu.sa

Abstract

Background: Vitamin D plays a very important role in maintaining a healthy skeleton. An individual with a deficiency of vitamin D is at a higher bone fracture risk. Type 1 diabetic adolescents show a lower peak bone mass in comparison with healthy peers, which may increase the risk of bone fracture at a later age. Thus, maintenance of a sufficient vitamin D level through optimal supply may be significantly important for healthy bones in children with type 1 diabetes.

Methods: This study comprised 100 children with type-1 diabetes and 100 non-diabetics. Serum 25-hydroxy-vitamin D, PTH, total serum calcium, phosphate, and alkaline phosphatase, were measured. Age, gender, and duration of type 1 diabetes were accounted. Body mass index was also calculated. The data obtained were analyzed by SPSS v.19 program according to the age, sex and vitamin D deficiency level.

Results: Out of 100 children 84 (84%) were vitamin D deficient (compared to control; 58%), defined as a 25-hydroxy-vitamin-D level below 50 nmol/L. The deficiency was found directly proportional to the age. Female children showed higher prevalence of vitamin D deficiency compared to males (59%). Despite the high prevalence of vitamin D deficiency, we found a lower prevalence of secondary hyperparathyroidism in children and adolescent patients.

Conclusions: Prevalence of vitamin D deficiency in diabetic children and adolescents is high. Females are significantly associated with the vitamin D deficiency. Therefore, screening for vitamin D deficiency in children and particularly in girls is recommended in the studied population.

Introduction

Vitamin D is a fat-soluble vitamin. It has the important function role in bone metabolism and possibly has some anti-inflammatory and immune-modulating properties. Vitamin D is a precursor hormone and the building block of a steroid hormone calcitriol. It is usually found in two forms. One is vitamin D2, present in plants and some fish and the other is cholecalciferol, or vitamin D3, and is synthesized in the skin by sunlight. Vitamin D requirements can be fulfilled either by ingesting vitamin D or by exposure to sun for a sufficient time to produce required amounts. Vitamin D has an important role in calcium absorption in the small intestine. Along with parathyroid hormone, it maintains calcium homeostasis in the blood stream by mediating skeletal mineralization of the same [1]. Hence, vitamin D has a major impact on bone health. Severe vitamin D deficiency may cause rickets in infants [2] and osteomalacia in adults [3]. A higher bone fracture risk in elderly people is accompanied with low serum vitamin D levels. [4]. In addition, vitamin D deficiency is common in children with type 1 diabetes mellitus (T1DM) [5].

The most accurate way to measure vitamin D content in the human body is the 25-hydroxy vitamin D (25D) assessment in blood serum [6]. Although, the American Academy of Pediatrics has recommended the serum level of 25D below 27.5 nmol/L in children as vitamin D deficiency [7]. As a matter of fact, rickets in infants and children has been reported at 25D levels below 37.5 nMol/L [8, 9]. However, there is no consensus on the 25D levels that can be regarded as sufficient in children, to date. Hence, in the present study a cut off value of 25D, <50nMol/L was opted as deficiency [6].
Diabetes mellitus has an adverse effect on the skeleton and seemingly increases the risk of osteoporosis as well as fragility fractures. The exact mechanism of lowering the bone strength is not fully understood but may include impaired accrual of peak bone mass and diabetic complications, such as nephropathy. T1DM is more damaging than type 2 diabetes mellitus (T2DM) for strength of bone [10]. A lower bone mass in children with T1DM compared to healthy ones has been reported in many clinical studies [11].

However, there is a lack of adequate studies on association of vitamin D deficiency in diabetic children from the Middle East region. A clinical study on a Qatari population showed that the severe vitamin D deficiency was considerably prevalent in children with T1DM compared to healthy children [12]. Due to the high rate of incidence of vitamin D inadequacy in children and adolescents with T1DM, a routine screening for vitamin D deficiency, optimal vitamin D supply and close follow-up are being recommended [10, 13].

The objective of the present study was to assess the prevalence of vitamin D deficiency in children and adolescent patients with T1DM and to determine the factors which may possibly influence serum vitamin D levels. For example, age, serum calcium, serum phosphate, serum alkaline phosphatase, body mass index and duration of diabetes. In addition to that, intact parathyroid hormone (iPTH) concentration was also determined to assess secondary hyperparathyroidism in patients with vitamin D deficiency. A prospective, cross-sectional study was performed in children and adolescents with T1DM examined during January to December 2011 at Security Forces Hospital, Riyadh, Saudi Arabia.

Subjects and Methods

Study Subjects

One hundred Saudi children (59 females and 41 males) with T1DM (of more than 5 months duration) and 100 non-diabetic children (52 females and 48 males) were selected. The age of children included in this study was in the range of 2-17 years. Children on vitamin D, calcium supplementation, or with diabetic complications, such as diabetic nephropathy and those suffering from chronic illnesses, such as gastrointestinal disorders, malabsorption and celiac disease were excluded from study. The study was approved by the University Review Board at King Saud University and the Ethical Committee of the concerned hospital. A written informed consent was taken from the patient's guardians. A questionnaire for evaluating the daily consumption of dairy products and calcium-rich mineral water and exposure to sun was used. General physical examinations of patients were measured using standard methods [14]. Body mass index (BMI) was calculated as weight (kg) divided by height squared (m2) [15].

Laboratory Findings

Quantitative biochemical assays for 25D, iPTH and bone profile (calcium, magnesium, phosphorus, and alkaline phosphatase) were performed. Serum iPTH was determined using an electrochemiluminescent immune assay (Roche Modular E170, Roche Diagnostics Corp., Indianapolis, USA). Serum 25D levels was determined by using the high-performance liquid chromatography method. Due to the lack of consensus on the titer of 25D as sufficient for healthy individuals we considered a mild deficiency as concentration of 25 D <50 nMol/L, moderate deficiency <25 nMol/L and severe deficiency <12.5 nMol/L. The HbA1c was measured using high-performance liquid chromatography (reference range: 4-6%).

Statistical Analysis

Results are expressed as mean ± standard error of mean (SEM). All the statistical analysis was performed using the SPSS 19 program (PSS Inc. Chicago, IL, USA). Student's t-test was performed to compare the means between male and female groups of control and patients. For detailed analysis patients and controls were grouped according to the deficiency of vitamin D as severe deficiency, moderate deficiency and mild deficiency. Differences of means among the groups were analyzed by one-way ANOVA. *X*2- test was performed to find out the differences in proportions of control and patients in

the three groups. Differences of means were considered significant at P<0.05. All the results were tabulated into contingency tables.

Results

In the present study 100 children and adolescents with T1DM and 100 non-diabetic children were assessed for the clinical and laboratory findings. None of the participants had any history of low intensity trauma bone fracture or any bone deformities. Forty one (41%) patients were males and fifty nine (59%) were females whereas forty eight (48%) controls were males and fifty two (52%) were female. Most of the patient children were white or brownish white (92%) and the remaining were black (8%). Among the controls 89% were white and 11% were black. The mean (±SEM) of assayed biochemical and physical parameters of the whole group is shown in Table 1 and those of sex wise two groups in Table 2. The mean of 25D in patients was 36.78 ± 1.43 nMol/L which was significantly lower (p<0.001) than that of controls 46.05 ± 1.40 nMol/L. Serum phosphate was also significantly lower in patients in comparison with controls (p<0.05). However, serum alkaline phosphatase of patients was significantly higher than that of controls (p<0.001)(Table-1).

PTH, calcium and phosphate levels were almost similar in patients and controls of females (p=0.59, 0.21, and 0.15 respectively). However calcium and phosphate levels were significantly (p<0.05 and 0.01) lower (2.28 ± 0.02 mMol/L and 1.56 ± 0.04 mMol/L respectively) in male patients compared to male controls (2.34 ± 0.15 mMol/L and 1.63 ± 0.02 mMol/L respectively). 24D in male and female patients were 39.58 ± 2.19 nMol/L and 34.83 ± 1.98 nMol/L respectively and significantly lower than that of male and female controls (p<0.001 and =0.05 respectively). Alkaline phosphatase was significantly higher in both male and female patients compared to respective controls (p<0.01 and 0.05 respectively) and were lower in male patients than that of male controls (Table 2).

Out of 100 patients 84 were vitamin D deficient whereas 58 controls were vitamin D deficient out of 100 (Table 3). A comparison of different clinical and biochemical parameters among severe, moderate and mild vitamin deficient patients and controls are tabulated in Table 3 (next page). Although, no statistically significant differences were found among the patients and controls of three vitamin deficient groups for their age, serum phosphate level and body mass index (p=0.47, 0.66 and 0.52 respectively). However, the age of severely, moderately and mildly vitamin deficient patients were 11.75 ± 0.85, 10.0 ± 0.53 and 9.77 ± 0.42 respectively. Serum calcium level was lowest (2.17 ± 0.04, p<0.05) in severely vitamin deficient patients compared to respective controls as well as patients and controls of the other two groups. Serum PTH was 75.0 ± 26.65 and 80.14 ± 28.84 mMol/L for severely vitamin D deficient patients and moderately deficient controls which were not greatly different. Interestingly, longest duration of T1DM was found in severely deficient patients (52.5 ± 22.89 months) and followed by moderately and mildly vitamin deficient patients (p<0.05).

Discussion

In this study, we found that children with T1DM have a high prevalence of vitamin D deficiency (84 patients compared to 58 in controls). Vitamin D levels showed 25D deficiency directly proportional to the age (Table 4 - page 34). Earlier, Svoren et al (2009) produced a similar report in which vitamin D deficiency was more prevalent among older children [13]. Contrarily, in a Swedish population serum 25D levels were above 50 nMol/L in teenagers with T1DM [16]. Female patients had a lower 25D level (34.83 ± 1.98 nMol/L) than males (39.58 ± 2.19 nMol/L) (Table 2 - opposite). Furthermore, moderate and mild vitamin D deficient children and adolescents with T1DM have a low prevalence of secondary hyperparathyroidism compared to severe vitamin D deficiency (Table 4). Similarly, level of serum calcium was significantly lower in severely deficient patients than

	Mean ± SEM		*p*-value
Characteristics	Patients	Controls	
Age (Years)	9.53 ± 0.32	8.36 ± 0.2	<0.01
25-hydroxy vitamin D (nM/L)	36.78 ± 1.43	46.05 ± 1.40	<0.001
Parathyroid Hormone (pg/mL)	47.82 ± 2.16	47.26 ± 4.26	0.90
Calcium (mM/L)	2.32 ± 0.01	2.33 ± 0.01	0.59
Phosphate (mM/L)	1.54 ± 0.02	1.6 ± 0.02	<0.05
Alkaline Phosphatase (Units/L)	274.84 ± 7.83	233.76 ± 6.22	<0.001
Body Mass Index	17.64 ± 0.36	17.88 ± 0.29	0.62
Duration of Type 1 diabetes (Months)	38.24 ± 3.26	NA	NA

Table 1: Comparison of means (± SEM) between patients and control's biochemical and physical characteristics

Characteristics	Male		p-value	Female		p-value
	Patients	Controls		Patients	Controls	
Age	8.98 ±0.42	8.04 ± 0.31	<0.05	9.9 ± 0.47	8.65 ± 0.26	<0.02
25-hydroxy vitamin D (nM/L)	39.58 ± 2.19	51.04 ± 1.62	<0.001	34.83 ± 1.98	41.44 ± 2.06	0.05
Parathyroid Hormone (pg/mL)	43.61 ± 3.39	39.2 ± 2.34	0.53	50.74 ± 2.80	54.69 ± 7.81	0.59
Calcium (mM/L)	2.28 ± 0.02	2.34 ± 0.15	<0.05	2.35 ± 0.01	2.32 ± 0.01	0.21
Phosphate (mM/L)	1.56 ± 0.04	1.63 ± 0.02	<0.05	1.52 ± 0.03	1.58 ± 0.02	0.15
Alkaline Phosphatase (Units/L)	276.48 ±11.85	226.89 ±9.09	<0.01	273.69 ±10.7	240.09 ±8.52	<0.05
Body Mass Index	17.48 ± 0.52	17.4 ± 0.39	0.7	17.74 ± 0.49	18.32 ± 0.43	0.22
Duration of Type 1 diabetes (Months)	29.7 ± 3.82	NA		44.13 ± 4.72	NA	

Table 2: Mean of biochemical and physical characteristics of patients compared with controls according to their sex.

those of moderate and mild deficiency patients (Table 4; Figures 1 & 2 - following pages).

Most importantly, we found that the prevalence of vitamin D deficiency in the studied population is very much higher than other studies in Australia, USA and Sweden etc. In the studied Saudi population, 84% of the children with T1DM were found to be vitamin deficient. This percentage of prevalence is much higher than that of 60.5% in a Swiss population [5], 43% in an Australian population [17], 25% in an Italian population [18] and 15% in a North American population [13]. However, a study from Qatar reported a prevalence of vitamin D deficiency in 90.6% children with T1DM [12]. This variability may be due to differences in food behavior, exposure to sun, geographical conditions, skin complexion, and/or genetic constitutions.

Prevalence of secondary hyperparathyroidism was high in the severely vitamin D deficient group. However, secondary hyperparathyroidism was not observed in very low, in moderate, or mild vitamin D deficient patients. In contrast, PTH levels never fell below 40 pg/ml in any of the sub groups of studied subjects. That is higher than 10 pg/ml expected for the continuous secretion of PTH [19]. In adults, PTH levels are expected to rise steeply above 40 pg/ml at 25D levels below 50 nmol/L and above 50 pg/ml at 25 D levels below 25 nmol/L [20]. This relationship seems to be less pronounced in healthy adolescents [21]. No expected rise in PTH level in diabetic children above 7 years in our study can be explained by the following facts; (i) PTH-vitamin D axis has a blunted response in diabetic patients [22]. In one study a blunted response of PTH was associated with low magnesium levels and corrected after magnesium repletion [23] and (ii) hypocalcaemia was very mild, so it would not been sufficient to induce a rise in PTH in patients [19].

Major limitations of our study include inaccuracy of calcium rich diet (milk, fish etc.) measurement, and the exact duration of sun exposure and seasonal change in serum vitamin D level fluctuation. In conclusion, our study reported that vitamin D deficiency is directly proportional to the duration of diabetes and highly prevalent in female patients in the studied population. Furthermore, a low prevalence of secondary hyperparathyroidism was found in vitamin D deficient children. The present study recommends the screening of vitamin D deficiency and their supplementation even for children and adolescents with 25D levels between 37.5-75 nmol/L to prevent bone disease in early adulthood [24]. This study may be helpful for further studies to identify mechanisms responsible for the low prevalence of secondary hyperparathyroidism in T1D subjects with low vitamin D levels.

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	Vitamin D deficiency level		
	Severe <12.5nM/L)	Moderate (12.6-25nM/L)	Mild 26-<50nM/L
Patients (84)	4 (4.76%)	17 (20.23%)	63 (52.92%)
Control (58)	2 (3.44%)	7 (12.06%)	49 (84.48%)

χ^2=1.88; d.f.-2; *P*=0.38

Table 3: Differences in proportions of patients and controls according to the vitamin D deficiency

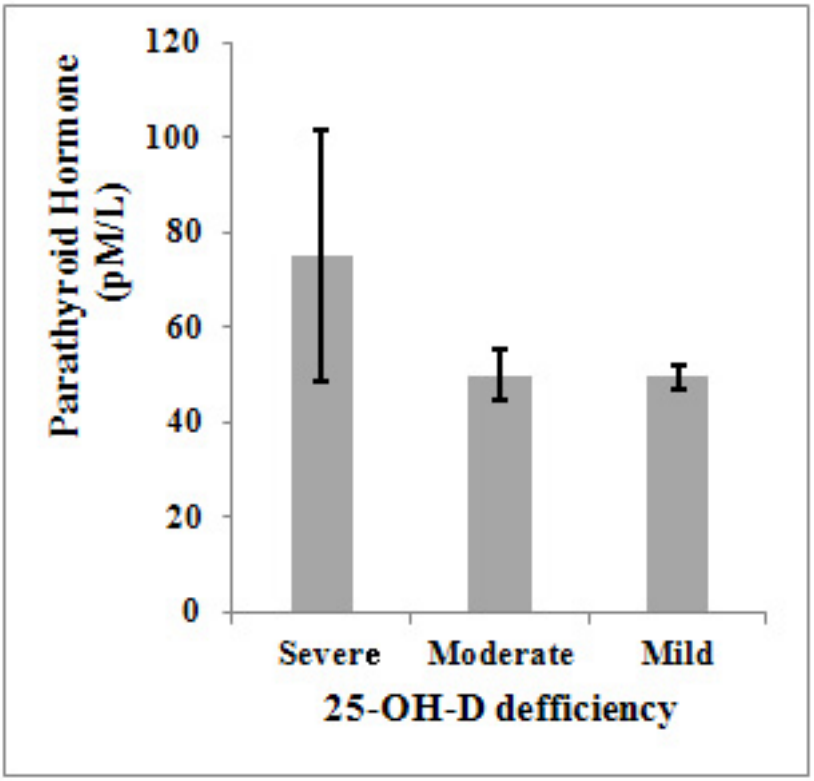

Figure 1: Parathyroid Hormone (mean±SEM) according to 25D levels-One-way-ANOVA showed significant difference between the means (P = 0.04). The graph shows that parathyroid hormone was significantly lower in patients with moderate and mild vitamin D deficiency compared to severely deficient patients.

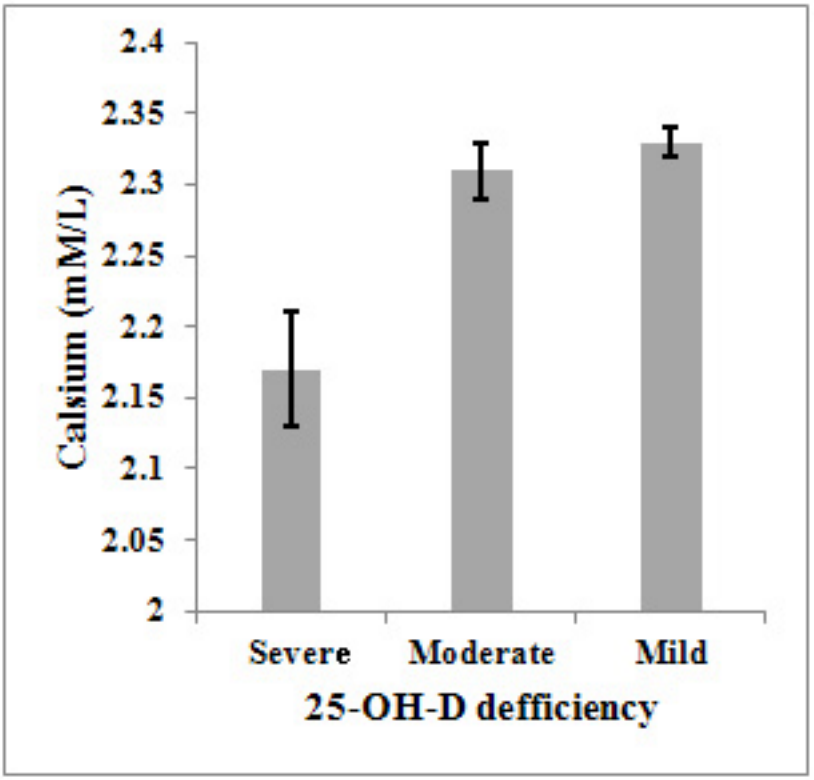

Figure 2: Serum calcium (mean±SEM) according to 25D levels-One-way-ANOVA showed significant difference between the means (P = 0.02). The graph shows that serum calcium was significantly lower in severely vitamin D deficient patients compared to patients with moderate and mild vitamin D deficiency.

Characteristics	Vitamin D deficiency level						P-value
	Severe (<12.5nMol/L)		Moderate (12.6-25nMol/L)		Mild (26-<50nMol/L)		
	Patients	Control	Patients	Control	Patients	Control	
Age	11.75 ± 0.85 a	10.0 ± 1.41 a	10.0 ± 0.53 a	9.14 ± 0.91 a	9.77 ± 0.42 a	8.51 ± 0.28 b	0.47
25-hydroxy vitamin D (nM/L)	9.25 ± 0.75 c	10 ± 0.0 c	21.82 ± 0.56 b	21.85 ± 0.98 b	36.31 ± 0.74 a	39.79 ± 0.80 a	<0.001
Parathyroid Hormone (pg/mL)	75.0 ± 26.65 a	35.0 ± 9 c	49.82 ± 5.45 b	80.14 ± 28.84 a	49.44 ± 2.31 b	52.81 ± 7.20 b	<0.05
Calcium (mM/L)	2.17 ± 0.04 b	2.35 ± 0.05 a	2.31 ± 0.02 a	2.31 ± 0.03 a	2.33 ± 0.01 a	2.32 ± 0.01 a	<0.05
Phosphate (mM/L)	1.47 ± 0.06 a	1.5 ± 0.1 a	1.57 ± 0.05 a	1.65 ± 0.07 a	1.51 ± 0.03 a	1.60 ± 0.03 a	0.66
Alkaline Phosphatase (Units/L)	322.75 ± 36.17 a	195.5 ± 10.5 c	282.44 ± 18.47 a	246.14 ± 22.63 b	266.17 ± 10.19 a	235.20 ± 9.94 b	<0.05
Body Mass Index	16.72 ± 1.16 a	16.8 ± 0.2 a	19.6 ± 1.11 a	19.2 ± 1.88 a	17.7 ± 0.43 a	17.92 ± 0.41 a	0.52
Duration of Type 1 diabetes (Months)	52.5 ± 22.89 a	NA	43.47 ± 6.4 a	NA	39.98 ± 4.39 b	NA	<0.05

Table 4: Comparison of mean of biochemical and physical characteristics of patients and control categorized according to vitamin D deficiency level

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Knowledge and practice of dietary habits and healthy lifestyle in a sample of medical and non medical college students in Baghdad

Lamia Dhia ALdeen
Ban Faud Ibrahim

Correspondence:
Lamia Dhia ALdeen
Email: lamiadia57@yahoo.com

Abstract

Background : Health related practices such as lifestyle patterns are important predictors of future health and since medical students represent a significant community investment so any information that may help us to promote their health will preserve this investment.

Aim of the study: To throw a light on the differences in knowledge and practices regarding dietary habits and healthy lifestyle among medical and non-medical students in Baghdad along with assessment of any perceived barriers.

Subjects and methods: This cross-sectional study included 350 students from 6 colleges, three medical and three non-medical colleges, in the period between 10th of February till 20th of May 2012.

Simple random sampling was used in the selection of the colleges and students. Data was collected by direct interview using a questionnaire which was employed to assess knowledge and barriers to healthy practices among the students.

Results: The knowledge score of medical students was better (with 94.7% of the medical students scoring good>17versus52%) than non-medical students. Conversely the diet and lifestyle score (36- point scale) in medical students was poor (<27) in 65.9% of them and in non-medical students was fair (27-31) in 57.2% of the students. 'Lack of time' was cited as the most important reason for skipping meals and as a barrier to exercising regularly, among both groups.

Conclusion: The knowledge and practices of medical students in Baghdad suggest that superior knowledge about healthy lifestyle does not necessarily result into better practices.

Key words: Knowledge, practice, dietary habits, college students

Introduction

College life is an important stage for individuals as at this time their lives are in transition and in fact, the student's social role of learning is largely defined by a readiness to change, and since studies indicated that individuals who have basic nutritional knowledge and attitude apply these principles when selecting foods so improving nutritional knowledge, attitude, and dietary practices through nutritional education may help to prevent or mitigate chronic diseases and cancers. Ideally, if college students make positive changes in exercise and dietary habits, these changes could persist into adult years. [1] [.2].

Most college students may not achieve the nutrition and exercise guidelines designed to reduce the risk of chronic disease, typically consuming a diet high in fat, sodium and sugar and low in fruits and vegetables. These poor eating habits may result from frequent snacking, excess dieting, and consumption of calorie dense but nutrient poor snacks and meals, such as those provided by fast food restaurants. In addition despite the recognized benefit of exercise, surveys of college students' health habits indicate that only 35% have a regular schedule of physical activity and that a slightly higher proportion of men 40% than women 32% regularly exercise .[3]4].

To throw a light on the knowledge and practice of healthy dietary habits and lifestyle among medical and non medical students in Baghdad, this study was conducted.

Subjects and Methods

A cross-sectional study was carried out over a period of 3 months from the10th of February till 20th of May 2012 in six colleges in Baghdad; three of them were medical (Baghdad medical college, Almustansiryia medical college, Baghdad dental college) and three were non-medical colleges, (Baghdad

college of sciences. Baghdad College of engineering, College of Education Ibn Al Haitham).

Simple random sampling technique was used in the selection of the medical and non-medical colleges and in the selection of students through visiting the colleges 2-3 times per week; each visit took about 4-5 hours.

The questionnaire contains a total of 30 questions broadly divided into10 questions for the assessment of knowledge about dietary habits and healthy lifestyle, 18 questions about lifestyle and dietary practices and lastly 2 questions about perceived barriers.
.
At the end of each interview the participant was thanked for (his\her) cooperation.

The response rate was 97.2 %.

Exclusion criteria
Those with clinically diagnosed chronic diseases or on prescribed medication.

Official permission and ethical approval were obtained.

Statistical analysis
The data collected was analyzed by using SPSS version 20 (Statistical Package For Social Sciences). Data were presented in numbers, percentages, simple tables, mean, SD. Scoring systems were developed with the purpose of comparison between the two study groups; one system was to quantify knowledge about healthy diet and lifestyle practices of both subgroups where it gives one point for the wrong answer and two points for the correct answer; later summation of the points was done.

There were 10 questions regarding knowledge and the maximum score was 20. If the scoring points were 18-20 it was considered (good), if 15-17 (fair), 10-14 (poor). The range is (10-20). The other system was to quantify dietary and lifestyle habits of both sub groups which also gives one point for the wrong answer and two points for the correct one.

18 Questions regarding practice maximum score 36
32 -36 (good)
27-31 (fair)
18-26 (poor)

The range was (18-36).

Results

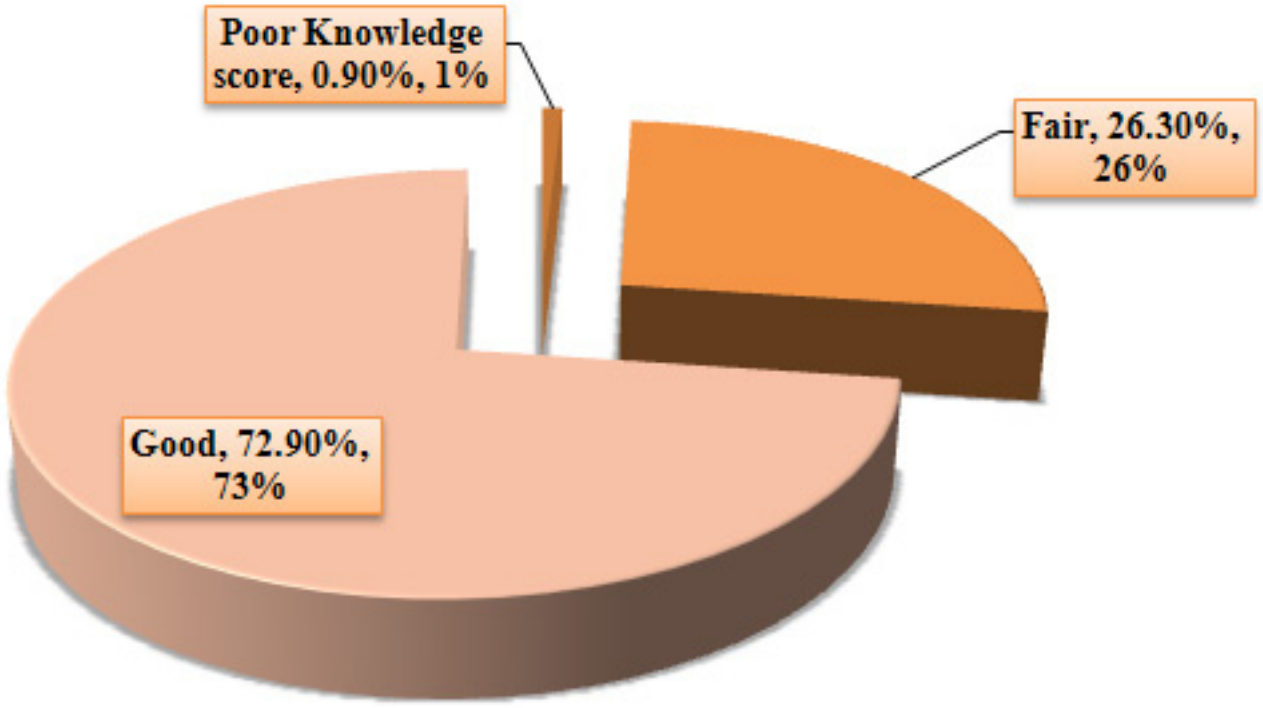
During the study period 350 students were interviewed. 170 [48.6%] were medical and 180 [51.4%] were non medical students as shown in Table 1 which shows also the distribution of the students according to the current year of the study where most of them were from the final years (73.5% from the 4th,5th and 6th years).

Table 1: Distribution of the students according to the colleges and current year of the study

		Total students	
		No	%
Students	Medical	170	48.6
	Non-Medical	180	51.4
College	Al-Mustansiriyah Medical College	34	9.7
	Baghdad Medical College	66	18.9
	Baghdad Dental College	70	20.0
	Ibn El-Haitham College of Education	70	20.0
	Baghdad College of Sciences	60	17.1
	Baghdad College of Engineering	50	14.3
Current year of the study	2nd	43	12.3
	3rd	50	14.3
	4th	107	30.6
	5th	50	14.3
	6th	100	28.6

The scoring knowledge shows that 73% of the students scored good with a mean of (18.45±1.48) while 26% scored fair and 1% scored poor. (Figure 1)

Figure 1: The knowledge score levels of all students



A very high percentage of medical students (94.7 %) scored good compared to only (52.2 %) of non medical students and only 1% of all students scored poor. All were from the non medical group. (Table 2)(Figures 2 and 3).

Table 2: knowledge score levels in medical and non medical students

		Total students n=350		Medical N_1=170		Non-Medical N_2=180	
		No	%	No	%	No	%
Knowledge score	Poor	3	0.9	-	-	3	1.7
	Fair	92	26.3	9	5.3	83	46.1
	Good	255	72.9	161	94.7	94	52.2

Table 5 (page 42) shows the knowledge of the medical and non medical groups according to dietary habits and healthy life style. The results showed that most medical students knew the right answers; they knew that breakfast is the important meal in the day (90% versus 79.4% in non medical), they also knew they must get most of the calories from the carbohydrates (88% versus 72.2% in non medical), the body needs about 2 cups of milk/day (95.3% versus 74.4% of the non medical), aware that water soluble vitamins should be daily eaten (94.7% versus 84.4% in non medical), correctly answered that average hours of exercise needed/ week are 4 hours (92.9% versus 77.8%), the average hours of sleep needed/day are 8 hours (94.7% versus 57.8%),white is the healthiest type of meat (95.3% versus 66.7%), juice is the healthiest choice mentioned in the breakfast (94.7% versus 75%) and skimmed products are better than non skimmed ones (96.5% versus 77.8% in non medical students).

Figure 2: The knowledge score of medical students

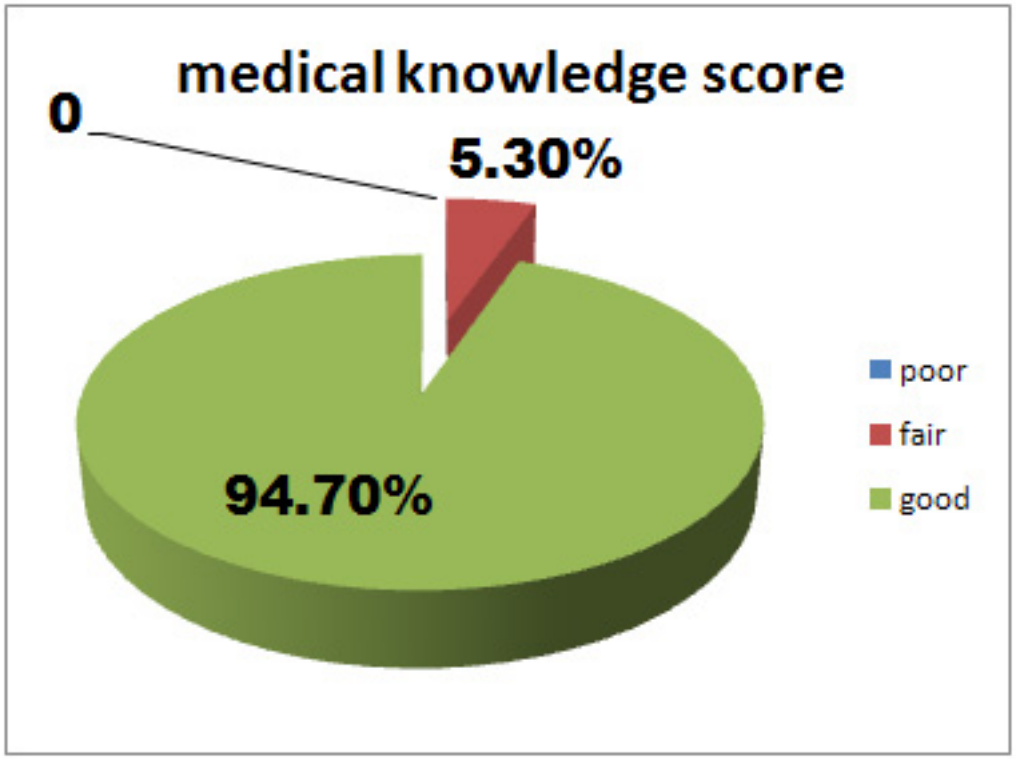


Figure 3: The knowledge score of non medical students

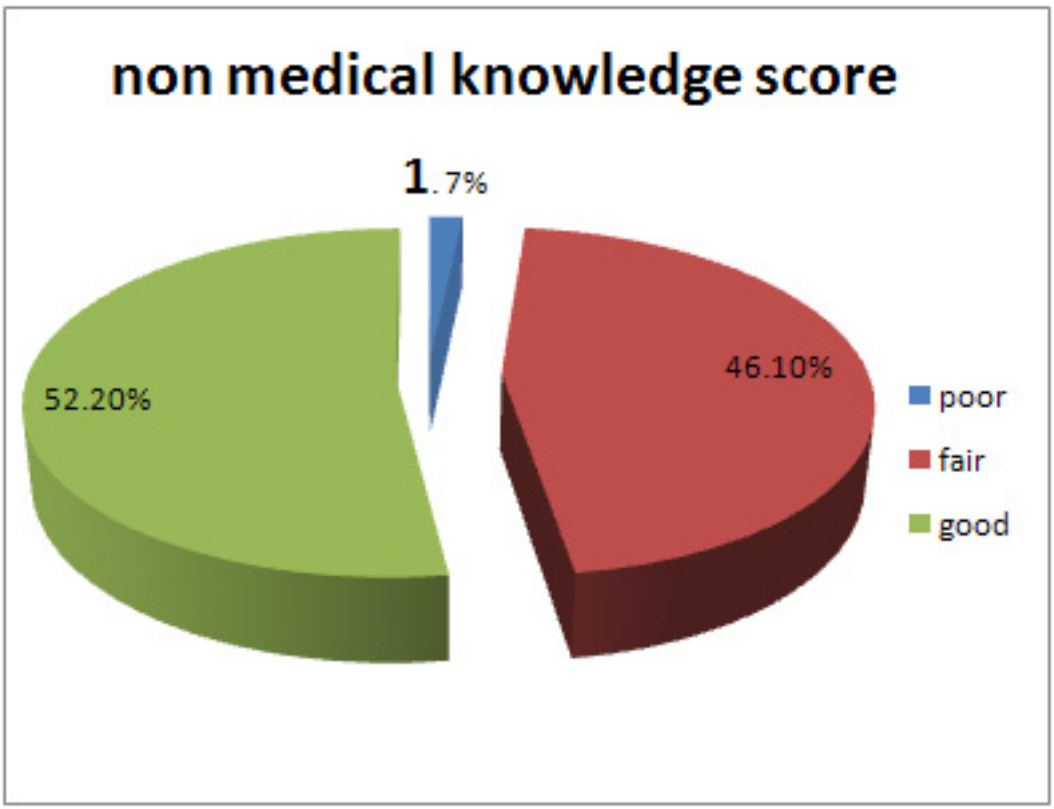


Table 4: Knowledge score levels of the students according to Current year of the study

		Knowledge score%					
		Medical			Non-Medical		
		Poor	Fair	Good	Poor	Fair	Good
Current year of the study	2nd	-	-	-	33.3	24.1	23.4
	3rd	-	-	-	33.3	31.3	24.5
	4th	-	11.1	11.8	33.3	44.6	52.1
	5th	-	33.3	29.2	-	-	-
	6th	-	55.6	59.0	-	-	-

(Table 6 - page 43) shows that more than two thirds of the medical students (65.9%) have poor practice versus (20.6%) of the non medical. On the other hand more than half of the non medical students (57.2%) scored fair versus (45.4%) of the non medical group(p=0.0001). (Table 6) (Figures 5 and 6).

Figure 5: Medical students practice score

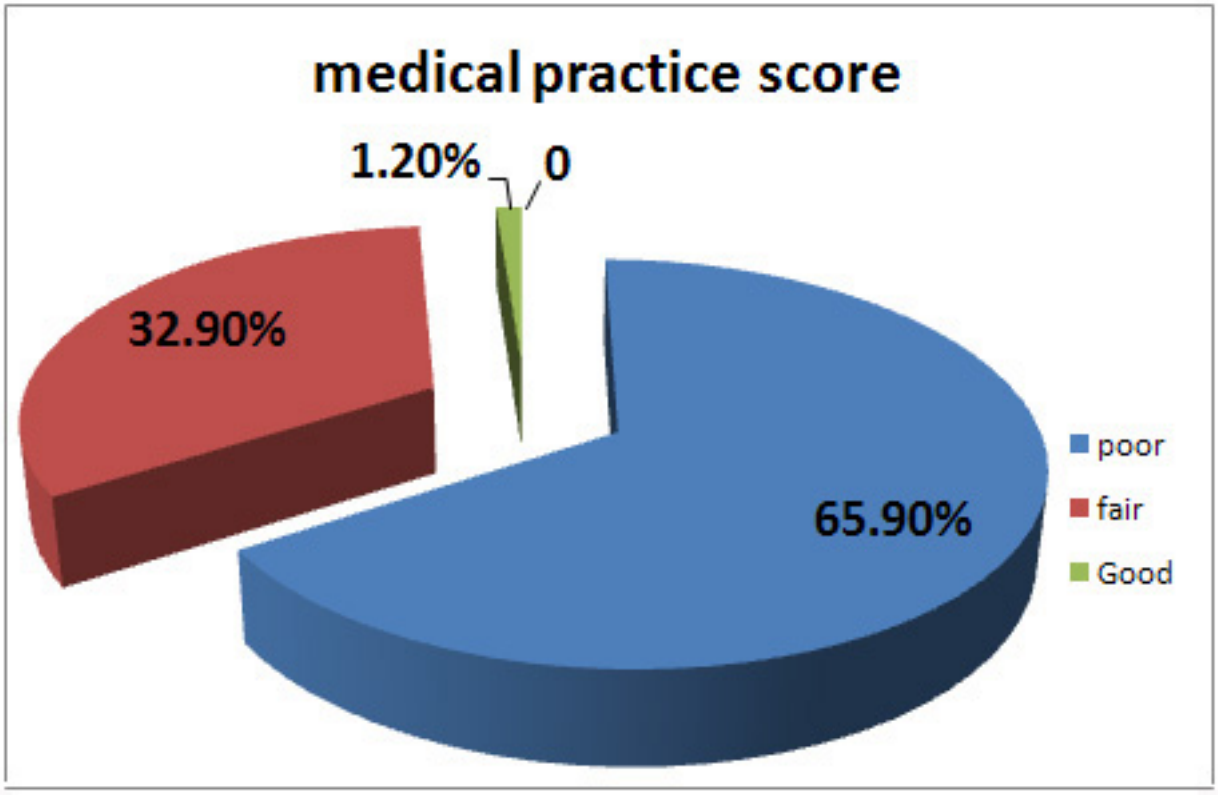


Table 8 (pages 44-45) shows the distribution of the students according to their dietary habits and life style practice where about half (48.9%) of the students reported having three meals a day, breakfast was the most commonly missed meal in both groups followed by supper in the medical group and dinner in the non medical group.

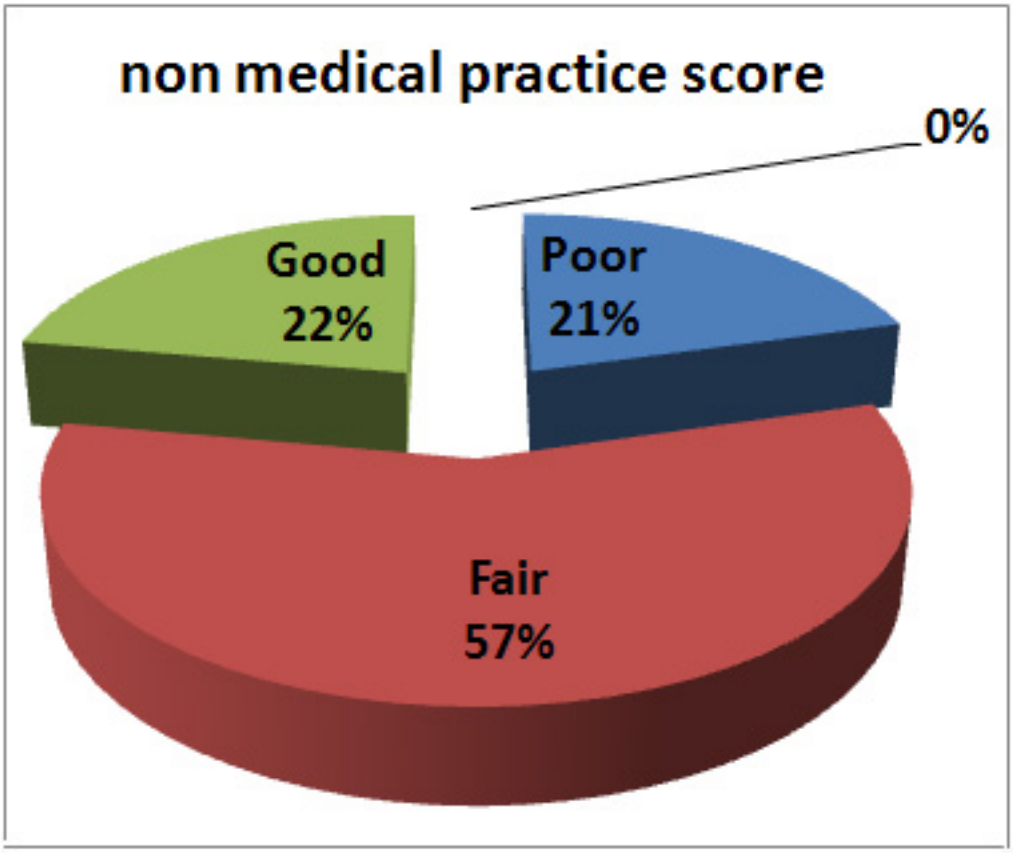
Table 5: Distribution of studied sample according to their knowledge about dietary habits and healthy life style

Knowledge about health dietary habit and life style (10 Q)		Total students n=350		Medical N_1=170		Non-Medical N_2=180	
		No	%	No	%	No	%
Most important meal in the day	**Breakfast**	**296**	**84.6**	**153**	**90.0**	**143**	**79.4**
	Dinner	40	11.4	13	7.6	27	15.0
	Supper	14	4.0	4	2.4	10	5.6
We must get most of the calories from	Fat	43	12.3	7	4.1	36	20.0
	Carbohydrates	**280**	**80.**	**150**	**88.**	**130**	**72.2**
	Protein	27	7.7	13	7.6	14	7.8
Our body needs about cup of milk/day	1	23	6.6	5	2.9	18	10.0
	2	**296**	**84.6**	**162**	**95.3**	**134**	**74.4**
	4	31	8.9	3	1.8	28	15.6
What are the vitamins that should be daily eaten	**Water soluble**	**313**	**89.4**	**161**	**94.7**	**152**	**84.4**
	Fat soluble	6	1.7	5	2.9	1	0.6
	Both	31	8.9	4	2.4	27	15.0
What is healthier	Corn oil	16	4.6	5	2.9	11	6.1
	Olive oil	**329**	**94.**	**163**	**95.**	**166**	**92.**
	Palm oil	5	1.4	2	1.2	3	1.7
Average hours of exercise needed/ week	2	1	0.3	1	0.6	.	.
	4	**298**	**85.1**	**158**	**92.9**	**140**	**77.8**
	6	51	14.6	11	6.5	40	22.2
Average hours of sleep needed/day	6	44	12.6	5	2.9	39	21.7
	8	**265**	**75.7**	**161**	**94.7**	**104**	**57.8**
	10	41	11.7	4	2.4	37	20.6
What is the healthier	**Red meat**	**54**	**15.4**	**8**	**4.7**	**46**	**25.6**
	White meat	282	80.6	162	95.3	120	66.7
	Same	14	4.0	.	.	14	7.8
Healthiest choice in breakfast	Coffee	10	2.9	2	1.2	8	4.4
	Tea	44	12.6	7	4.1	37	20.6
	Juice	**296**	**84.6**	**161**	**94.7**	**135**	**75.0**
Your opinion about skimmed product	**Better**	**304**	**86.9**	**164**	**96.5**	**140**	**77.8**

Table 6: The practice score of medical and non medical students

		Total students n=350		Medical N_1=170		Non-Medical N_2=180		
		No	%	No	%	No	%	χ^2;d.f.;P value
Practice score	Poor	149	42.6	112	65.9	37	20.6	
	Fair	159	45.4	56	32.9	103	57.2	
	Good	42	12.0	2	1.2	40	22.2	

Figure 6: Non medical students practice score



Discussion

The knowledge level of all students about dietary habits and lifestyle was high as 72% of the participants scored good (94.7% of the medical and 52% of the non-medical), similar results but with lower percentages found. In Rubina et al [5] where 35% of the medical students scored >6 (the maximum is 10) versus 14.4% of the non-medical students. This was expected due to the fact that the medical students were enrolled in a six-year health sciences study and on the other hand, all the non-medical universities had students enrolled in information technology and business management and sciences course where little about health and diet is taught.

More than half of the medical students who scored good (59%) and who scored fair (55.6%) were in the 6th year of study; also half of the non-medical students who scored good (52.1%) and who scored fair (44.6%) were in the 4th year of the study. This was expected as 74% of the sample was from the last 3 years of the study and also because we expect the knowledge to increase as the students' progress in their study. Similar results was seen in the study of Sakamaki et al[6] on Chinese medical students' nutritional knowledge and the year of their study. This difference in results may be due to small sample size in the current study.

The overall practice was disappointing as only 12% of all the sample has a

Table 8: Distribution of the students according to the dietary habits and life style practice

Practice (18 Q)		Total students n=350		Medical N_1=170		Non-Medical N_2=180	
		No	%	No	%	No	%
What types of food do you normally snack on?	Chips, crackers nuts	60	17.1	20	11.8	40	22.2
	Ice cream cookies candy	1	0.3	-	-	1	0.6
	Fast food	59	16.9	50	29.4	9	5.0
	Vegetables and fruits	**230**	**65.7**	**100**	**58.8**	**130**	**72.2**
How often do you drink regular soda or other sugared beverage (1cup=1 serving?)	**Never**	**139**	**39.7**	**40**	**23.5**	**99**	**55.0**
	Occasionally	7	2.0	2	1.2	5	2.8
	Few\w	26	7.4	15	8.8	11	6.1
	1-2\ d	112	32.0	67	39.4	45	25.0
	2-3\d	35	10.0	25	14.7	10	5.6
	>=4\d	31	8.9	21	12.4	10	5.6
What type of milk- yogurt do you consume?	Don't	151	43.1	97	57.1	54	30.0
	Skimmed or 1%	**94**	**26.9**	**30**	**17.6**	**64**	**35.6**
	Skimmed but others occasionally	11	3.1	3	1.8	8	4.4
	2% or whole	94	26.9	40	23.5	54	30.0
How often do you eat lean meats ?(Lean beef, Chicken, turkey, fish)	Never	3	0.9	-	-	3	1.7
	<=1\w	18	5.1	-	-	18	10.0
	2-4\w	**184**	**52.6**	**90**	**52.9**	**94**	**52.2**
	>4\w	145	41.4	80	47.1	65	36.1
How often do you eat these meats (regular, hamburger, hotdog, corned beef, sausage, pastrami or liver	**Never**	**256**	**73.1**	**111**	**65.3**	**145**	**80.6**
	<=1\w	8	2.3	-	-	8	4.4
	2-4\w	22	6.3	-	-	22	12.2
	>4\w	64	18.3	59	34.7	5	2.8
How often do you eat vegetables (half cup cooked /one cup raw= one serving)	<=1\w	19	5.4	4	2.4	15	8.3
	2-6\w	78	22.3	51	30.0	27	15.0
	1\d	4	1.1	4	2.4	-	-
	2-3\d	115	32.9	68	40.0	47	26.1
	>4\d	**134**	**38.3**	**43**	**25.3**	**91**	**50.6**
How often do you eat whole or canned fruit(one piece or half cup canned= one serving)	<=1\w	6	1.7	-	-	6	3.3
	2-6\w	107	30.6	71	41.8	36	20.0
	1\d	3	0.9	3	1.8	-	-
	2-3\d	134	38.3	23	13.5	111	61.7
	.>4\d	**100**	**28.6**	**73**	**42.9**	**27**	**15.0**

How often do you exercise	0-2\w	191	54.6	116	68.2	75	41.7
	3-4\w	**155**	**44.3**	**52**	**30.6**	**103**	**57.2**
	>=5\w	4	1.1	2	1.2	2	1.1
At what level of intensity do you exercise	Light	183	52.3	114	67.1	69	38.3
	Moderate	159	45.4	50	29.4	109	60.6
	Heavy	8	2.3	6	3.5	2	1.1
No of meal/day	**3**	**171**	**48.9**	**1**	**0.6**	**170**	**94.4**
	2	153	43.7	153	90.0	-	-
	.>3	26	7.4	16	9.4	10	5.6
If <3 what is the most missed meal	Breakfast	23	88.5	13	81.3	10	100
	Supper	3	11.5	3	18.8	-	-
No of sleeping hours/ day and night	3-5	5	1.4	2	1.2	3	1.7
	6-8	**245**	**70.0**	**111**	**65.3**	**134**	**74.4**
	>8	100	28.6	57	33.5	43	23.9
Do you smoke	**No**	**260**	**74.3**	**142**	**83.5**	**118**	**65.6**
	Yes	90	25.7	28	16.5	62	34.4
Did college life improve your health	Nc	211	60.3	121	71.2	90	50.0
	Yes	**139**	**39.7**	**49**	**28.8**	**90**	**50.0**
Did college life decrease your caffeine intake	Nc	170	48.6	104	61.2	66	36.7
	Yes	**180**	**51.4**	**66**	**38.8**	**114**	**63.3**
	Yes	**130**	**37.1**	**36**	**21.2**	**94**	**52.2**
Do you avoid spice	No	175	50.0	110	64.7	65	36.1
	Yes	**175**	**50.0**	**60**	**35.3**	**115**	**63.9**
How often do you consume milk or its products	Never	156	44.6	100	58.8	56	31.1
	2-4/w	41	11.7	21	12.4	20	11.1
	>4/w	**153**	**43.7**	**49**	**28.8**	**104**	**57.8**

good practice score while 45% have fair and 43% have poor practice score.

There is a lack of health awareness among the general student population, as the typical university student diet is usually high in fat and they often select fast food due to its palatability, availability and convenience. [7] This also has been observed in other studies where students were practicing unhealthy dietary habits and made inappropriate choices [8].

The skipping of breakfast, which was common in the medical and non-medical group assessed by this study, is a very unhealthy practice that should be discouraged in university students who are in their habit forming years. Similar finding was seen in Maral et al study in Baghdad [3]. Skipping breakfast has been associated with lower nutritional status and an increased risk of developing cardiovascular diseases in the future. [9] Also regular breakfast consumption among medical students is important for sufficient energy intake to overcome fatigue due to a busy (daily) learning schedule[10].

A large number of students from both subgroups reported no decrease in caffeine intake after joining their current colleges. In Rubina et al[5] medical and non-medical students in Pakistan reported increase in their intake. High caffeine intake in adolescents has been linked with difficulty in sleeping, feeling tired in the morning and with high blood pressure.[11,12]

In the medical students lower percentage of exercise at the correct level (29.4% for moderate level) with lower percentage exercise at the correct frequency (30.6% exercise 3-4 times\w), similarly in Shaimaa study[13] 2011 in El Kasr El Aini the medical students (21.4%) practice half hour walking daily or moderately exercise 5 times a week.

The main barrier identified by the participants was lack of time. Medical students especially in their final years have to attend college and hospital daily or stay up late, studying leading to sleep deficits. Most medical students do not get time to exercise and eat healthier meals due to the demands of their studies and clinical rotations in the respective wards. Hence medical students are unable to translate knowledge into better practices due to the above mentioned barriers. This is supported by the finding that more medical students perceive that their institutions did not improve their health and did not decrease their caffeine intake compared to most of the non-medical students who reported positive change in this regard. This was consistent with Arzu et al 2006 [14] with lack of time seen as the most important reason for not having healthy eating habits, for skipping meals and exercising irregularly.

From the results of this study we feel that there is much room for improvement in the diet and exercise knowledge and practice of this college-aged population. The interventions could include increased curriculum time devoted to information about appropriate lifestyle, improved food choices at cafeterias that serve students and improved access to exercise facilities so that students can use their limited time efficiently.

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