



**AUSTRALIAN JOURNAL OF BASIC AND APPLIED SCIENCES**

ISSN:1991-8178 EISSN: 2309-8414  
Journal home page: www.ajbasweb.com



**Prevalence and Factors Associated With Obesity among 6th year Medical Students in Umm AL Qura University, Makkah Al- MokaRamah, 2015**

Hossam Hussen Hijazy<sup>1</sup>, Arif Eid Sady Al Subhi<sup>2</sup>, Hosam Wahid Wali<sup>3</sup>, Nahlah Tolat Haddad<sup>4</sup> and Maher Abdulsalam<sup>5</sup>

<sup>1</sup>Family Medicine Specialist Public Health in Makkah, KSA

<sup>2</sup>Public Health in Makkah, Nursing Technician, KSA

<sup>3</sup>General Practioner, Public Health in Makkah, KSA

<sup>4</sup>Family Medicine Specialist Al Khanash Primary Health Care, KSA

<sup>5</sup>Resident Doctor Public Health in Makkah, KSA

**Address For Correspondence:**

Hossam Hussen Hijazy , Family Medicine Specialist Public Health in Makkah, KSA

E-mail: [Hossamorec@gmail.com](mailto:Hossamorec@gmail.com)

**ARTICLE INFO**

*Article history:*

*Received 28 May 2017*

*Accepted 22 July 2017*

*Available online 26 July 2017*

**Keywords:**

*Obesity, Risk Factors, Prevalence, Medical Students*

**ABSTRACT**

**Background:** It's miles recognized that the health of physicians at once influences the health of the larger populace, as several studies have mounted a hyperlink among the health behaviors of physicians and their connection with patients. **Objectives:** To evaluate obesity and its associated risk factors as well as to measure nutritional habits among 6th year medical students in Makkah Al-Mokarramah city in 2015. **Materials and Methods:** A pass sectional take a look at was performed to include all 6th year medical students in Makkah, they are accounted for 167 students (106 female plus 61 male). A self-administered questionnaire was utilized and it is divided into five parts: Demographic data, weight and height measurements, smoking habit, physical exercise and nutrients assessment by Food Frequency Questionnaire<sup>16</sup>. The researcher met all the among 6th year medical students in Makkah Al-Mokarramah city in 2015, their height and weight were assessed, and then every subject was asked to fulfill the self-administered questionnaire. **Results:** the student's age are ranged between 21 and 30 years old with an average of 24.065 year and SD of 1.55. Where, greater than half females were single then 93.3% of under weights were females and 90.4% of normal weights were females whilst, 58.3% of over weights were found in males and 94.7% of obese were males. This difference was statistically significant (p-value < 0.001) 86.7% of under weights were single, 78.1% of normal weights were single, 71.7% of over weights were single and 78.9% of obese were single. There was a significant relation between systemic disease, self-perception regarding weight, current tobacco use and Body Mass Index (BMI) (p-value < 0.001, 0.001, 0.001). There was a significant relation among the working posture, practicing aerobic exercise, walking and BMI (p-value < 0.001, 0.039, 0.001). There is a significant relation between type of milk intake, orange juice intake, diet and BMI (p-value < 0.001, 0.004, 0.001). 6th year medical students who reported intake of fruit juice with sugar and soft drinks showed that higher significant rate of overweight and obesity compared to those who never had fresh vegetables or fresh fruit (73.7% and 73.7% versus 42.1% and 36.8% respectively). **Conclusion:** Popularity of overweight and obesity was high among the 6th year medical students in Makkah region, KSA. Physical inactivity, for male gender, permanent intake fruit juice with sugar and frequent intake of soft drinks with sugar were found to be predictors of obesity among 6th year medical students in Makkah Al-Mokarramah city..

**INTRODUCTION**

It's far diagnosed that the health of physicians immediately impacts the fitness of the bigger population, as numerous studies have set up a link among the fitness behaviors of physicians and their interactions with sufferers (Frank et al., 2010).

**Open Access Journal**

**Published BY AENSI Publication**

© 2017 AENSI Publisher All rights reserved

This work is licensed under the Creative Commons Attribution International License (CC BY).

<http://creativecommons.org/licenses/by/4.0/>



Open Access

**To Cite This Article:** Hossam Hussen Hijazy, Arif Eid Sady Al Subhi, Hosam Wahid Wali, Nahlah Tolat Haddad and Maher Abdulsalam. 2017. Prevalence and Factors Associated With Obesity among 6th year Medical Students in Umm AL Qura University, Makkah Al-MokaRamah, 2015. *Aust. J. Basic & Appl. Sci.*, 10(18): 365-376, 2017

In addition, workers can be more liable to terrible fitness behaviors along with smoking, drugs and alcohol abuse and less physical pastime. Musculoskeletal disorders (MSDs) are a sizeable reason of morbidity in healthcare people, and research at the effects of stressful paintings schedules on MSD chance is a place that wishes similarly exploration, (Van der Hulst., 2003) and interfere with the quality of healthcare provision (Fahrenkopf et al.,2008). Physicians are usually uncovered to excessive stages of occupational strain as a consequence of heavy workloads and excessive stages of time stress, and those in certain employment positions or specialties are at higher chance of laid low with despair issues than the overall population (Alpert., 2008).

In opposition to this history, enlightening sports have been actively pursued via countrywide scientific institutions in various remote places international locations, as part of an attempt to sell physicians main a favorable way of life in an effort to protect their very own health (Canadian Medical Association.,2011).

Obesity is becoming an international trouble affecting all stages of society and is being described as an international epidemic.WHO predicts that three billion people worldwide will be overweight or obese by 2015 (World Health Organization., 1998).

Obesity greatly increases the risk of developing cardiovascular disease, stroke, hypertension, and dyslipidemia and leads to increased mortality (National Institutes of Health., 1998). It is also associated with diabetes (Wang et al., 2005), some types of cancer (Folsom et al., 2000), psoriasis (Setty et al., 2007), <sup>adverse</sup> fertility and pregnancy outcomes (Wendland et al.,2007), liver, gall bladder diseases and earlier mortality in old age (Price et al.,2006), osteoarthritis, sleep apnea and many other health conditions. Furthermore it is also a component of the metabolic syndrome for most definitions (Grundy et al., 2005).

In Saudi Arabia, obesity is becoming one of the most important public health problems (Madani et al., 2000). Whilst, the statistics among physicians may reflect an enormous cultural trouble, therefore the researcher found it necessary to investigate the prevalence and factors associated with obesity among this important sector of the population; medical students.

#### ***Study objectives:***

To determine the dominance of obesity and its associated risk factors, as well as to measure nutritional habits among 6<sup>th</sup> year medical students in Makkah Al-Mokarramah city in 2015.

## **MATERIALS AND METHODS**

#### ***Study Area***

Holy city of Makkah Al-Mokarramah (Medical Collage in Umm Al Qura University in Makkah Al-Mokarramah).

#### ***Study Design:***

Cross sectional research design was adopted

#### ***Study Population and Sample Size:***

A sample size of 167 students (106 female plus 61 male) was obtained under the following conditions:

- A total population of interest- 6<sup>th</sup> year medical students of 285.
- A prevalence "response distribution": 50%
- A confidence level: 95%
- A margin of error: 5%

#### ***Sampling Method:***

Simple random sampling was used to select 167 students (106 female plus 61 male) out of 285 students.

#### ***Inclusion Criteria:***

6<sup>th</sup> year medical students in Umm Al Qura University in Makkah Al-Mokarramah.

Willing to participate in the study.

#### ***Exclusion Criteria:***

Unwilling to participate in the study.

#### ***Data Collection Tool and Technique:***

A self-administered questionnaire was utilized. The questionnaire is developed by the researcher after reviewing of current national and international related literature. It is divided into five parts:

**Part one:** Bio-socio-demographic information (age, gender, marital status, nationality and presence of medical diseases as hypertension, diabetes mellitus and ischemic heart disease).

**Part two:** Smoking habit. Cigarettes and others (type, duration and frequency)

**Part three:** Physical exercise using General Practice Physical Activity Questionnaire [GPPAQ] which is developed by the London School of Hygiene and Tropical Medicine as a validated short measure of physical activity (National Health Institute., 2010).

Physical exercise is using General Practice Physical Activity Questionnaire [GPPAQ] (National Health Institute., 2010), which is developed by the London School of Hygiene and Tropical Medicine as a validated short measure of physical activity. (The same above paragraph)

The GPPAQ is a validated screening tool that is used to assess adult (16 – 74 years) physical activity levels. It provides simple, 4-level Physical Activity Index (PAI) categorizing subjects to one of the following categories:

***Inactive:***

Sedentary job and no physical exercise or cycling

***Moderately Inactive:***

Sedentary job and some but < 1 hour physical exercise and / or cycling per week OR Standing job and no physical exercise or cycling

***Moderately Active:***

Sedentary job and 1-2.9 hours physical exercise and / or cycling per week OR Standing job and some but < 1 hour physical exercise and / or cycling per week OR Physical job and no physical exercise or cycling

***Active:***

Sedentary job and  $\geq 3$  hours physical exercise and / or cycling per week OR Standing job and 1-2.9 hours physical exercise and / or cycling per week OR Physical job and some but < 1 hour physical exercise and / or cycling per week OR Heavy manual job

**Part four:** Nutrition assessment by Food Frequency Questionnaire (Haftenberger et al.,2010) which is a valid simple tool measure the frequency of essential common meals (Therese et al.,2012).

**Part five:** Assessment of weight and height for all respondents in order to calculate the body mass index. Body mass index (BMI) was calculated and classified according to WHO criteria into:

- Underweight (BMI <15.8 kg/m<sup>2</sup>)
- Normal (BMI 18.5–24.9 kg/ m<sup>2</sup>)
- Overweight (BMI 25–29.9 kg/m<sup>2</sup>)
- Obesity (BMI  $\geq 30$  kg/m<sup>2</sup>)

***Questionnaire Validity***

A self-administered questionnaire, English version, It was revised by 2 family medicine consultants.

***Data Collection Technique:***

- 1- The researcher distributed self-administered questionnaire in the weekly meeting of the students after getting approval from the family medicine program director, and Umm Al Qura University.
- 2- The weekly meeting for male and female students was on Sunday and the distribution and collection was on the same day by the researcher himself in the male side, and in the female side was through the leader of the female 6<sup>th</sup> year.
- 3- The questionnaire was distributed to students by the researcher himself hand to hand, and then collected in the same way either immediately or after a period with follow up to those who did not respond immediately.

***Pilot Study:***

The questionnaire was first tested in a pilot study group of 15 medical students from the 5<sup>th</sup> year, to test the tool. The aim of the pilot study was to test for the comprehensibility of the questionnaire

***Statistical analysis for data:***

Data was collected, coded, verified and analyzed with a help of a biostatistician using Statistical Package for the Social Sciences (SPSS) program version 20 developed by International Business Machines (IBM®) corporation. Descriptive statistics, e.g., number, proportions, cumulative proportions, mean and standard deviation, etc. were displayed, as appropriate (SPSS Inc., 2008).

Analytically, parametric and non-parametric techniques were used as required. In order to control for the effect of confounding, multivariate logistic regression was adopted. All results of tests with  $p$ -values less than <0.05 was considered “statistically significant.”

**Ethical Considerations:**

Approval of research committee, the family medicine program director and Umm Al Qura University and Medical College were obtained. Written consents from all participants were obtained. Service was provided to the students in a form of (Health education materials). All information was kept confidential and was not accessed except for the purpose of the scientific research. Ethical consideration was observed through all the researcher steps.

**RESULTS****The relation between BMI and Age:**

From the results in Table (1) it could be noticed that, there is no significant relation between age and BMI. In underweight group the age was ranged from 23 to 26 years by Mean±SD (24.133±0.834). Normal weight group the age was ranged from 22 to 30 years by Mean±SD (23.863±0.962). Overweight group the age was ranged from 21 to 30 years by Mean±SD (24.317±1.970) while in Obesity group the age was ranged from 21 to 29 years by Mean±SD (24±2.211).

**The relation between BMI and Demographic data:**

The resultant from Table (2) showed that, there is a significant relation between BMI and gender (P-value<0.001). 93.3% of under weights were females while 6.7% of under weights were males. There is no relation between BMI and marital status of statically significance.

Table (1): The relation between body mass index and age:

BMI	Age					ANOVA	
	Range	Mean	±	SD	F	P-value	
Underweight	23 - 26	24.133	±	0.834	0.957	0.415	
Normal weight	22 - 30	23.863	±	0.962			
Overweight	21 - 30	24.317	±	1.970			
Obesity	21 - 29	24.000	±	2.211			

Table (2): The relation between body mass index and demographic data:

			BMI				Total	Chi-square		
			Underweight	Normal weight	Overweight	Obesity		X <sup>2</sup>	P-value	
Gender	Male	N	1	7	35	18	61	76.418	<0.001*	
		%	6.7%	9.6%	58.3%	94.7%				36.5%
	Female	N	14	66	25	1				106
		%	93.3%	90.4%	41.7%	5.3%				63.5%
Marital status	Single	N	13	57	43	15	128	4.847	0.564	
		%	86.7%	78.1%	71.7%	78.9%				76.6%
	Married	N	2	15	13	3				33
		%	13.3%	20.5%	21.7%	15.8%				19.8%
	Divorced	N	0	1	4	1				6
		%	0.0%	1.4%	6.7%	5.3%				3.6%

Regarding the relation between BMI and systemic diseases the data of the current research demonstrated that, there is a significant relation among BMI and Diabetes mellitus, hypercholesterolemia, ischemic heart disease and hypertension (p-value<0.001). It also showed that a significant relation between students' perception as obese or over weighted, their work posture and their BMI (p-value<0.001).

In addition, the results revealed that there is a significant relation between BMI and full fat milk intake (P-value<0.001) and 84.2% of obese had full fat milk >4/day 5.3% of obese never had full fat milk, 5.3% had 1-3/week while 5.3% had 4-6/week.

**The relation between BMI and Soft drinks with sugar:**

Table (3) shows that there is a significant relation between BMI and soft drink with sugar (P-value<0.001). 26.7% of over weights had soft drink with sugar 4-6/week, 21.7% never had soft drink with sugar, 16.7% had 1-3/month, 16.7% had 1-3/week, while 18.3% had >4/day. 73.7% of obese had soft drink with sugar >4/day, 15.8% had 4-6/week, 5.5% never had soft drink with sugar while 5.5% had 1-3/week.

Table (3): The relation between BMI and Soft drinks with sugar"

Soft drinks with sugar		BMI				Total	Chi-square	
		Underweight	Normal weight	Overweight	Obesity		X <sup>2</sup>	P-value
Never	N	3	20	13	1	37	60.657	<0.001*
	%	20.0%	27.4%	21.7%	5.3%	22.2%		
1-3/month	N	1	24	10	0	35		
	%	6.7%	32.9%	16.7%	0.0%	21.0%		
1-3/week	N	6	16	10	1	33		
	%	40.0%	21.9%	16.7%	5.3%	19.8%		
4-6/week	N	2	11	16	3	32		
	%	13.3%	15.1%	26.7%	15.8%	19.2%		
>4/day	N	3	2	11	14	30		
	%	20.0%	2.7%	18.3%	73.7%	18.0%		
Total	N	15	73	60	19	167		
	%	100.0%	100.0%	100.0%	100.0%	100.0%		

Moreover, the results explain that the highest proportion of obese students have a high frequency intake of boiled potatoes, potato chips, whole meal bread, sweets, chocolate, savory snacks and pizza with a significant relation with BMI.

The results also explain that the highest proportion of obese students have a low frequency intake of fresh vegetables and fruits and fish with a significant relation with BMI.

## DISCUSSION

Obesity is one of the maximum critical chance aspects contributing to the general burden of sickness international. Recent studies show that there is increasing in prevalence of overweight and obesity worldwide and in Arabian Gulf states (Madani et al.,2000).

This study aimed to evaluate obesity prevalence and its associated factors among 6<sup>th</sup> year medical students in Umm Al Qura University in Makkah Al- Mokarramah 2015.

This study was conducted on 167 students (106 female plus 61 male). Their age was ranged between 21 and 30 years old with an average of 24.065 years and SD of 1.55 years. More than half of them (63.47%) were females. Most of them (76.65%) were single. 93.3% of under weights were females and 90.4% of normal weights were females while 58.3% of over weights were males and 94.7% of obese were males. 86.7% of under weights were single, 78.1% of normal weights were single, 71.7% of over weights were single and 78.9% of obese were single. In this context, Maddah (2007), a study conducted to assess the prevalence of obesity and dyslipidemia among young general physicians in Iran. He found that more than a quarter of physicians (26.7%) were obese and 21.7% were overweight whereas 48.3% were normal. Underweight was reported among two of them (3.3%). Obesity was more observed among male physicians than females (44.4% versus 12.1%).

In addition, Jafar et al., 2006 conducting a study to identify the prevalence of overweight and obesity and their affiliation with high blood pressure and diabetes mellitus in indo-asian population. They found that the dominance of overweight was high with the prevalence being higher for male compared with females, urban higher than rural and being an only child higher than having sibling children.

Related to the prevalence of obesity among medical students the results of the study were in line with Mahmoud et al., 2010, who conduct a study to determine the analysts of obesity among post-graduate trainee doctors working in a tertiary care hospital of public sector in Karachi. They found that the overall dominance rates of overweight among post graduate students were 28.5 and 10.2%, respectively (Mahmoud et al., 2010).

In current study, there was a significant relation between diabetes mellitus, hypertension, ischemic heart disease, hypercholesterolemia and BMI (p value <0.001). There was a significant relation between BMI and self-perception regard weight (P-value<0.001). 63.2% of obese were current tobacco users, there was a significant relation between BMI and current tobacco use (P-value<0.001). This result are in agreement with the same results by Fouad et al., 2006. Regarding physical inactivity, it was the same to other studies. In this study, there was a significant relation between BMI and the working posture (P-value<0.001). 89.5% of obese worked in sitting position. There was a significant relation between BMI and practicing aerobic exercise (p-value=0.039). 94.7% of obese didn't practice aerobic exercise.

Regarding diet, it was the same to other studies not having a healthy diet was associated with obesity and overweight. In this study, there was a significant relation between BMI and type of milk intake (P-value<0.001). 84.2% of obese had full fat milk >4/day, 52.6% of obese never had low fat milk, 52.6% of obese never had semi-skim milk, 47.4% of obese never had skimmed milk. There is a significant relation between BMI and orange juice intake (P-value=0.004). 47.4% of obese had orange juice 1-3/month. There is a significant relation between BMI and fruit juice drink with sugar (P-value<0.001). 73.7% of obese had fruit juice drink with sugar >4/day. There is a significant relation between BMI and fruit juice drink without sugar (P-value<0.001). 42.1% of obese never had fruit juice drink without sugar. In this study, data analyses revealed that the unhealthy eating habit of them was associated with obesity, 73.7% of obese had soft drink with sugar >4/day, 47.4% of obese never had soft drink without sugar, 36.8% of obese never had eaten boiled potatoes, 68.4% of obese had eaten potato chips >4/day, 42.1% of obese never had eaten fresh vegetables, 36.8% of obese never had eaten fresh fruit, 57.9% of obese had whole meal bread >4/day, 42.1% of obese never eaten had fish, 63.2% of obese had eaten pizza >4/day, 78.9% of obese had sweets >4/day, 73.7% of obese had chocolate >4/day and 84.2% of obese had savory snacks >4/day. These results were in accordance with Musaiger et al.2003, and Greenwood et al.2008 who pronounced a dose-dependency relationship among physical health and overweight occurrence. In, Yahia et al.,2008 Jordan study, the study concluded that, the elements at the back of overweight and obesity had been growing age, being woman, parental obesity, physical inactiveness, bad weight loss plan, low circle of relatives earnings and being nonsmoker.

### CONCLUSION:

The study concluded that the dominance of overweight and obesity was high among 6<sup>th</sup> year medical students in Umm Al Qura University in Makka Almokkaramah. Male gender, current tobacco use, Physical inactivity, working in sitting position, full fat milk intake, fruit juice drink with sugar, soft drinks with sugar, potato chips, whole meal bread pizza, sweets, chocolate and savory snacks were found to be predictors of obesity among medical students in Umm Al Qura university

### RECOMMENDATIONS

- Counseling medical student for smoking cessation.
- Increase awareness about importance of physical activity and schedule exercise programs.
- Instruction about working posture and necessity of changing position during work.
- Counseling dietary habits of medical students and providing them alternative of healthy diet.
- Providing clinical classes about life style modification.
- Regular medical examination of medical students for assessment of their health status.

### REFERENCES

- Alpert JS. Physician depression. *Am J Med* 2008; 121: 643.
- Canadian Medical Association. Centre for Physician Health and Well-being. [http://www.cma.ca/index.php/ci\\_id/25541/la\\_id/1.htm](http://www.cma.ca/index.php/ci_id/25541/la_id/1.htm). Accessed August 1, 2011.
- Fahrenkopf AM, Sectish TC, Barger LK, Sharek PJ, Lewin D, Chiang VW, Edwards S, Wiedermann BL, Landrigan CP .Rates of medication errors among depressed and burnt out residents: prospective cohort study. *BMJ* 2008; 336: 488–91.
- Folsom AR, Kushi LH, Anderson KE, Mink PJ, Olson JE, Hong CP, Sellers TA, Lazovich D, Prineas RJ . Associations of general and abdominal obesity with multiple health outcomes in older women: the Iowa Women's Health Study. *Arch Intern Med* 2000; 160(14):2117-2128.
- Fouad M, Rastam S, Ward K, Mazlak W. Prevalence of obesity and its associated factors in Aleppo, Syria. *Prev Control* 2006; 2: 85-94
- Frank E, Segura C, Shen H, Oberg E. Predictors of Canadian physicians' prevention counseling practices. *Can J Pub Health* 2010; 101:390-395.
- Greenwood JIJ, Stanford JB. Preventing or improving obesity by addressing specific eating patterns. *Am Board Fam Med* 2008March-April 21(2):135-140
- Grundy SM, Cleeman JI, Daniels SR, Donato KA, Eckel RH, Franklin BA, Gordon DJ, Krauss RM, Savage PJ, Smith SC Jr, Spertus JA, Costa F . Diagnosis and management of the metabolic syndrome: an American Heart Association/National Heart, Lung, and Blood Institute Scientific Statement. *Circulation* 2005; 112(17):2735- 2752.

- Haftenberger M, Heuer T, Heidemann C, Kube F, Krems C, Mensink G. Relative validation of a food frequency questionnaire for national health and nutrition monitoring. *Nutrition Journal* 2010; 9:36 Available at: <http://www.nutritionj.com/content/9/1/36>
- Jafar T, Chaturvedi N, Pappas G. Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in Indo-Asian population. *CMAJ* 2006; 175: 1071-7.
- Madani KA, Al-Amoudi NS, Kumosani TA. The state of nutrition in Saudi Arabia. *Nutrition and Health*.2000; 14:17-31.
- Maddah M. Obesity and dyslipidemia among young general physicians in Iran. *Int J Cardiol*. 2007 May 16; 118(1):111-2.
- Mahmood S, Najjad MK, Ali N, Yousuf N, Hamid Y. Predictors of obesity among post graduate trainee doctors working in a tertiary care hospital of public sector in Karachi, Pakistan. *J Pak Med Assoc*. 2010 Sep; 60(9):758-61.
- Musaiger AO, Lloyd OL, Al-Neyadi SM, Bener AB: Lifestyle factors associated with obesity among male university students in the United Arab Emirates. *Nutrition & Food Science* 2003, 33(4):145-147.
- National Health Institute (NHS). The general practice physical activity questionnaire (GPPAQ), 2006.
- National Heart, Lung, and Blood Institute in cooperation with The National Institutes of Diabetes and Digestive and Kidney Diseases (1998). *Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report*. Bethesda, MD: National Institutes of Health.
- Price GM, Uauy R, Breeze E, Bulpitt CJ, Fletcher AE. Weight, shape, and mortality risk in older persons: elevated waist-hip ratio, not high body mass index, is associated with a greater risk of death. *Am J Clin Nutr* 2006; 84(2):449-460.
- Setty AR, Curhan G, Choi HK .Obesity, waist circumference, weight change, and the risk of psoriasis in women: Nurses' Health Study II. *Arch Intern Med* 2007; 167(15):1670-1675.
- SPSS Inc. *Statistical Package for the Social Sciences*, 21. Chicago, Illinois: SPSS Inc, 2008.
- Therese LI, Nina CV, Lene FA. Evaluation of a short food frequency questionnaire used among Norwegian children. *Food and Nutrition Research*; 2012; 56: p1. Available at: <http://www.Foodandnutritionresearch.net/index.php/fnr/article/view/6399/19272-AF0003>
- Van der Hulst M. Long work hours and health. *Scand J Work Environ Health* 2003; 29: 171–88.
- Wang Y, Rimm EB, Stampfer MJ, Willett WC, Hu FB. Comparison of abdominal adiposity and overall obesity in predicting risk of type 2 diabetes among men. *Am J Clin Nutr* 2005; 81(3):555-63.
- Wendland EM, Duncan BB, Mengue SS, Nucci LB, Schmidt MI .Waist circumference in the prediction of obesity-related adverse pregnancy outcomes. *Cad Saude Publica* 2007; 23(2):391-398.
- World Health Organization. Global prevalence and secular trends in obesity. In: *Obesity preventing and managing the global epidemic, Report of a WHO Consultation on Obesity*. WHO, Geneva, 1998; pp 17–40.
- Yahia N, Achkar A, Abdallah A, Rizk S. Eating habits and obesity among Lebanese university students. *Nutrition Journal* 2008, 7:32