Knowledge of Female University Students about Obesity and its Adverse Effects on Reproductive Health

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Abstract

Background & Objective(s): Obesity remains a public health challenge, particularly in developing countries. Research has denoted the relation between obesity and some female general and reproductive health problems including hypertension, diabetes, infertility, miscarriage, stillbirth, birth defects and cesarean section. The high prevalence rates of obesity in developing countries may reflect lack of adequate knowledge about obesity. The aim of the present work was to estimate the prevalence rate of obesity among female university students and assess their knowledge regarding obesity and its adverse effects on reproductive health.

Methods: A cross-sectional study was conducted among 400 female university students attending the Outpatient Clinics affiliated to Alexandria University. Students were selected using systematic random sampling technique. Students’ knowledge about obesity, its risk factors and adverse effects was assessed using a self-administered questionnaire. Weight and height were measured for each student and body mass index (BMI) was calculated.

Results: The present study revealed that 31.5% of the studied students were overweight and 11% were obese (grade I). The mean BMI was 25.13 ± 3.63 kg/m². About one quarter (24%) had poor knowledge about the effect of obesity on reproductive health, as 85% considered oocyte development and maturation better in obese females and 71% reported that obesity reduced the risk of developing early menopause. A notable percentage of them did not know that obesity increased the risk of stillbirth (28%) and miscarriage (24.2%).

Conclusion: Prevalence rate of overweight and obesity among sampled female university students in Alexandria was high and a considerable proportion lacked knowledge about the effect of overweight/obesity on their reproductive health.

Keywords: Female university students; knowledge; obesity; Reproductive health.

INTRODUCTION

Obesity remains a public health challenge, particularly in developing countries.1 The prevalence of obesity has shown a significant increase in several countries of Eastern Mediterranean Region including Egypt and Gulf Region Arab countries.2,3 This increase resulted in higher rates of coronary heart diseases, diabetes mellitus, hypertension, and some forms of cancer.1,4

The increasing mechanization, industrialization and urbanization occurring in most countries around the world is associated with changes in diet and behavior. Diets are becoming richer in fat and high energy food and lifestyles are becoming more sedentary. While metabolic alteration exists in obesity, endocrine disorders alone or in association with genetic diseases and other rare metabolic disorders account for only 5% of obesity cases.5 The 2014 Egypt Demographic and Health Survey (EDHS) found that one-quarter of children and adolescents aged 5-19 years were overweight, 10% and 11% of females and males respectively were obese.6 The trend of obesity is steadily increasing among young adults aging 18–25 years.7 Under the influence of a variety of popular cultures, incorrect information and peer pressure typical of this age group, university students are at a higher risk of making unhealthy lifestyle choices that could affect their health and wellbeing across their future life.8,9

Reproductive health is a part of the overall health status of individuals and significantly impacts their quality of life.10,11 Research has denoted the relation between obesity and the development of female reproductive health
problems including: infertility\textsuperscript{(12,13)} miscarriage\textsuperscript{(14,15)} stillbirth,\textsuperscript{(16)} birth defects\textsuperscript{(17)} and cesarean section.\textsuperscript{(18)} Evidence from literature suggests that offsprings of obese mothers are at an increased risk of hyperglycemia, hyperlipidemia\textsuperscript{(19,20)} and obesity.\textsuperscript{(21,22)} Moreover, obesity has been linked to increased risk of breast cancer\textsuperscript{(23)} and endometrial cancer.\textsuperscript{(24,25)}

Egyptian female university students do not receive sufficient education through the formal education in schools and university system about the risk factors of obesity and its effect on the general and reproductive health.\textsuperscript{(26)} Knowledge about obesity and its impact on the general and reproductive health is necessary, although not sufficient, for acquiring healthy behaviors such as healthy dieting and exercise.\textsuperscript{(27)} The aim of present work was to estimate the prevalence of obesity among female university students and to assess their knowledge regarding obesity and its adverse effects on reproductive health.

METHODS

A cross-sectional study was conducted among 400 female university students attending the outpatient clinics (ophthalmology, dental and dermatology clinics) affiliated to Alexandria University for minor complaints. The sample was calculated assuming 50% prevalence of poor knowledge among the university students, using 5% degree of precision, $\alpha$ of 0.05 and power of 80%. The sample size was calculated using EPI-Info 2002 software. Sample was equally allocated from each of the previously mentioned clinics. Each clinic was visited by the researcher 3 times per week. In each clinic, the predetermined sample was selected by including every third female student.

A predesigned structured self-administered questionnaire was used to collect socio-demographic data and data about the students’ knowledge about obesity. The level of knowledge was measured using a scale constructed by the researcher based on a comprehensive review of literature. The scale was pilot tested on thirty female university students chosen at random and some questions were modified and reworded according to the pilot study. The scale was composed of four subscales measuring knowledge about risk factors of obesity (24 questions), adverse effects of obesity on general health (15 questions), adverse effects of obesity on reproductive health (16 questions) and body mass index (BMI, 3 questions). Students responded to each question by “yes”, “no” or “do not know”. The correct response was given one point, the incorrect and uncertain responses were given zero points. The mean and standard deviation were calculated for the total and subtotal scores for all students. The score was converted to percentage and students’ knowledge was categorized into poor (<50%), fair (50-75%) and good (>75%). The internal consistency of the subscales, as determined by Cronbach’s alpha coefficients, ranged from 0.67 to 0.71.

Anthropometric measurements were carried out for every student. Body weight was recorded to the nearest 0.1 kg with the digital scale. The scale was calibrated and checked daily against a known weight before use for accuracy. The student stood erect, in light clothing and bare footed on the center of the scale without touching anything else. Height was measured using a non-stretch tape fixed on the wall. Each student was asked to remove shoes and anything on head, stand erect on the flat floor: feet were together with heels, buttocks, back of the shoulders and back of the head touching the wall adjacent to the tape. The student was asked to look forward so that the line of vision was parallel to the floor and the arms hanging at the sides. A plastic block was placed on the top of the head with the sides of the block resting firmly against the wall to form a right angle. Height was recorded to the nearest 0.1 cm.\textsuperscript{(28)}

Body mass index (BMI) was calculated for each student using the following formula: The weight in kilograms divided by the square of the height in meters (kg/m\textsuperscript{2}).\textsuperscript{(29)} Students were classified according to their BMI as underweight (<18.5 kg/m\textsuperscript{2}), normal (18.5 to 24.9 kg/m\textsuperscript{2}), overweight (25 to 29.9 kg/m\textsuperscript{2}), obese class I (30 to 34.9 kg/m\textsuperscript{2}), obese class II (35 to 39.9 kg/m\textsuperscript{2}) and obese class III (≥40 kg/m\textsuperscript{2}).\textsuperscript{(30)}

Statistical analysis

Data entry and statistical analysis were performed using SPSS version 20.0 (IBM Corporation, Armonk, NY, USA). Percentages, frequencies, means and standard deviations were used to describe the demographic variables, anthropometric measures and knowledge level. Analytical statistics were used to investigate the association between knowledge and anthropometric measures. Statistical significance was set at $p < 0.05$.

Ethical considerations

The study was approved by the Ethics Committee of High Institute of Public Health, Alexandria University, Egypt. After explaining the aim of the study, verbal informed consent was obtained from participants and their anonymity and confidentiality were guaranteed.

RESULTS

Table 1 shows that the mean age of the studied students was 21.59±1.57 years, 30.8% of them were medical students, 45.3% of their mothers and 54.0% of their fathers had university education.

The results revealed that 31.5% of students were overweight and 11% were obese grade I. The mean BMI was 25.13 ± 3.63 kg/m\textsuperscript{2} (Figure 1). Most students had the correct information that overweight/ obesity may lead to irregular menstruation (97.3%), gestational diabetes (92%), macrosomic baby (64.7%) and thrombo-embolic disorders during pregnancy (61%). A big proportion of students had false information that oocyte development and maturation were better in obese females, that obesity reduced the risk of developing early menopause and that there was no association between obesity and obstructed labor (85%, 71% and 49.3%, respectively). More than one quarter of the sample (28%) did not know that obesity increased the
risk of still birth and about one quarter did not know that obesity increased the risk of developing miscarriage (24.2%) and of early menopause (23%) (Table 2).

Table 1: Sociodemographic characteristics of Alexandria University female students

| Demographic characteristics | Female university students (n=400) |
|-----------------------------|-----------------------------------|
| Age                         |                                   |
| Min. – Max.                 | 18.0 – 24.0                       |
| Mean ± SD                   | 21.59 ± 1.57                      |
| Faculty                     |                                   |
| Medical                     | 123                               |
| Non-medical                 | 277                               |
| Mother's Education          |                                   |
| Illiterate or read and write/| 28                                |
| Primary/preparatory         | 52                                |
| Secondary                   | 100                               |
| University/postgraduate     | 220                               |
| Father's Education          |                                   |
| Illiterate or read and write/| 4                                 |
| Primary/ Preparatory        | 28                                |
| Secondary                   | 68                                |
| University/ Postgraduate    | 300                               |

Table 2: Knowledge of Alexandria female university students about the effect of obesity on reproductive health

| Effect of obesity on reproductive health                     | University students' responses (n=400) |
|--------------------------------------------------------------|---------------------------------------|
|                                                             | Correct  | Incorrect  | Do not know |
|                                                             | No.      | %         | No.        | %         |
| Overweight doubles the likelihood of early menarche          | 179      | 44.7      | 177        | 44.3      | 44        | 11.0 |
| Overweight may lead to irregular menstruation                | 389      | 97.3      | 11         | 2.7       | 0         | 0.0  |
| There is no association between obesity and fecundity*       | 258      | 64.5      | 102        | 25.5      | 40        | 10.0 |
| Obesity increases incidence of getting PCOS                  | 124      | 31.0      | 117        | 29.3      | 159       | 39.7 |
| Oocyte development and maturation is better in obese females*| 340      | 85.0      | 12         | 3.0       | 48        | 12.0 |
| Obesity reduces the risk of developing early menopause*      | 284      | 71.0      | 24         | 6.0       | 92        | 23.0 |
| Obesity increases the risk of developing miscarriage         | 201      | 50.0      | 103        | 25.8      | 96        | 24.2 |
| Obesity increases the risk of getting pre-eclampsia          | 226      | 56.5      | 90         | 22.5      | 84        | 21.0 |
| There is no association between obesity and cesarean section*| 214      | 53.5      | 130        | 32.5      | 56        | 14.0 |
| Thrombo-embolism during pregnancy is considered one of the complications of obesity | 244 | 61.0 | 23.0 | 64 | 16.0 |
| Obesity increase the risk of getting gestational diabetes    | 368      | 92.0      | 12         | 3.0       | 20        | 5.0  |
| There is no association between obesity and obstructed labor*| 197      | 49.3      | 119        | 29.7      | 84        | 21.0 |
| Obesity decreases fetal development and maturation           | 136      | 34.0      | 176        | 44.0      | 88        | 22.0 |
| There is no association between obesity and fetal congenital anomalies* | 168 | 42.0 | 144 | 36.0 | 88 | 22.0 |
| Obesity increases the risk of still birth                     | 200      | 50.0      | 88         | 22.0      | 112       | 28.0 |
| Obesity increases the risk of getting macrosomic baby        | 259      | 64.7      | 97         | 24.3      | 44        | 11.0 |
Regarding adverse effects of obesity on general health, 28.8% and 36.3% indicated that obesity was related to cancer colon and cancer breast, 81.7%, 74.7% and 60.5% stated that obesity was a risk factor of hypertension, diabetes and osteoporosis respectively (Data not presented). About half or more of the students having good or fair knowledge showed normal BMI (50.7% & 56.7% respectively), these percentages decreased for overweight (37% & 40% respectively) and obese students (11.6% &12.4% respectively). However, no significant association was found between students’ overall knowledge and their BMI (Table 4). About one quarter of students whose mothers and fathers had university education and above had good overall obesity-related knowledge (27.7% and 23% respectively), whereas, none of those whose mothers and fathers were illiterate, had primary, preparatory or secondary education reached that level of knowledge. The relation between mothers’ and fathers’ education and students’ obesity-related knowledge was statistically significant ($\chi^2=51.349$, $\chi^2=48.765$, $p<0.001$, respectively) (Table 5).

### Table 3: Level of Knowledge of Alexandria female university students about risk factors and effect of obesity on reproductive health

| Knowledge subscales                                      | Poor | Fair | Good | % score | Mean ± SD |
|----------------------------------------------------------|------|------|------|---------|-----------|
| Knowledge about Risk factors of obesity                  | 0    | 124  | 276  | 69.0    | 80.69±9.36|
| Knowledge about Effects of obesity on general health     | 104  | 258  | 38   | 9.5     | 57.87±12.73|
| Knowledge about Effects of obesity on reproductive health| 96   | 268  | 36   | 9.0     | 56.64±15.04|
| Knowledge about body mass index                          | 302  | 26   | 8    | 18.0    | 37.50±34.51|
| Overall knowledge                                        | 8    | 323  | 69   | 17.3    | 65.92±9.32|

SD: standard deviation

### Table 4. Distribution of Alexandria female university students according to their BMI and their level of knowledge

| BMI               | Poor (n = 8) | Fair (n = 323) | Good (n = 69) | $\chi^2$ | p    |
|-------------------|--------------|----------------|---------------|--------|-----|
| Normal            | 8            | 131            | 51            |        |     |
| Overweight        | 0            | 0              | 7             | 3.79   | 0.43|
| Obese grade I,II  | 0            | 0              | 8             |        |     |
Table 5: Relation between Alexandria female university students’ level of knowledge and their parents’ education

| Parents’ education | Level of knowledge | No. | % | No. | % | No. | % | No. | % | χ² | p       |
|-------------------|--------------------|-----|---|-----|---|-----|---|-----|---|-----|--------|
|                   | Poor (n = 8)       | 0   | 0.0 | 28  | 100.0 | 0   | 0.0 | 28  | 100.0 |        |        |
|                   | Fair (n = 323)     | 4   | 1.2 | 68  | 100.0 | 5   | 1.6 | 61  | 100.0 |        |        |
|                   | Good (n = 69)      | 0   | 0.0 | 0   | 100.0 | 0   | 0.0 | 0   | 100.0 |        |        |
|                   | Total (n = 400)    | 4   | 1.0 | 92  | 100.0 | 5   | 1.3 | 61  | 100.0 | 40.55  | <0.001 |

*Significant (p<0.05)

DISCUSSION

The present findings revealed that the prevalence rate of overweight and obesity altogether was 43.5% among female university students in Alexandria, with overweight being 31.5% and obesity 12%. These figures are not far from those of a previous study conducted on Alexandria university students (2017)(31), where 28.9% of students were overweight and 11.8% were obese.

In a similar vein, studying the effects of overweight and obesity in 195 countries over 25 years revealed that 35% of Egyptian adults (around 19 million Egyptians) suffered from obesity.(32) These high rates may be attributed to the tremendous changes in lifestyle in the recent eras, these include physical inactivity patterns (such as riding cars, using elevators and not practicing sports) and dietary habits (such as consumption of energy dense foods as fast food and soft drinks). Such dramatic lifestyle changes are thought to have contributed immensely to the increase in obesity prevalence among young adults in developing countries. A small percentage of students had good overall knowledge about obesity which may provide some explanation for the high prevalence rate of overweight and obesity among them.

Despite the fact that most students in the current work have heard about BMI, they could not respond correctly to items concerning BMI. This finding draws the attention to the need for educating students about BMI and its implications as an important indicator of overweight and obesity. In contradiction to our findings, a study conducted in New York (2014) showed that more than half of the participants had fair knowledge of BMI.(33) The present study revealed that the majority of studied students had good knowledge about the risk factors of obesity including dietary fat, sedentary life, and sleeping immediately after meals. In agreement with our findings, the previously mentioned study conducted in New York(33) and another Korean study(34) indicated that most participants had good knowledge about obesity risk factors. In their study, Winston et al., reported that most participants were aware that high blood pressure (94%), diabetes mellitus type II (96%) and joint pains/arthritis (89%) were associated with overweight/obesity.(33) In Nigeria, 81.3% of female undergraduate students realized the relation between hypertension and obesity.(35) In accordance with the previous findings, the present results revealed that a high percentage of students were aware of the association between obesity and hypertension, diabetes mellitus and osteoarthritis. However, lower percentages of participants who had known the relation between cancer and obesity were reported in several studies including the current one.

A population-based study among 2250 Iranian women (2014) showed that only 42.57% of women were aware that obesity was a risk factor for cancer breast.(36) Consistently, an American study demonstrated that 45% of obese women and 49% of overweight women were not knowledgeable about the relation between increased risk of breast cancer and obesity.(37) Similar findings were reported by other studies.(38-40) The rates described in the present work are even lower than the pre-mentioned rates, this may be attributed to the different study populations. These findings highlight an ongoing need for raising the awareness regarding the relation between the increased risk of breast cancer with obesity.

In their study conducted in urban Chicago, Cardozo et al., reported that more than one third of women were aware of the association between obesity and some reproductive health issues including miscarriage (37.5%), irregular menstruation (35.8%) and infertility (33.9%). Lower proportions of women were aware about other adverse effects, including cesarean section (30.8%), birth defects (23.7%), stillbirth (14.1%) and endometrial cancer (18.1%).(40) These figures are not far from those in our study, where about half of the sampled students identified some of the adverse effects of obesity on reproductive health including pre-eclampsia (56.5%), caesarean
section (53.5%), stillbirth (50%), miscarriage (50%), early menarche (44.7%), and birth defects (42%). Whereas, 64.5% were aware that obesity was a risk factor for infertility and only 31% recognized polycystic ovaries as an adverse effect of obesity. Although the rates reported in our study are somewhat higher, probably due to the different population characteristics in both studies,20 these figures reveal a non-negligible gap between the students’ current and required knowledge about the association between obesity and reproductive health.

Limitations of the study
Conducting the study on university students produced a highly educated, young aged sample, thus, generalization of findings on the Egyptian population is not possible. Moreover, our study population was females only which made the generalization of findings on male population not appropriate. The present study found that the prevalence rate of obesity among the studied female university student population, however, generalization would require a larger sample size.

CONCLUSION AND RECOMMENDATIONS
The present study found that the prevalence rate of overweight and obesity among the studied female university students was high and that a considerable proportion of them had poor knowledge about the effects of obesity on their reproductive health. These students need more education about the impact of obesity on their reproductive health.

Conflict of Interest
The authors report no conflicts of interest in this work.

REFERENCES
1. Boutayeb A, Boutayeb S, Boutayeb W. Multi-morbidity of non-communicable diseases and equity in WHO Eastern Mediterranean countries. Int J Equity Health. 2013;12:60.
2. World Health Organization (WHO). Global Health Observatory data repository. Mean body mass index trends among adults, age-standardized. Geneva: WHO; 2016.
3. World Health Organization (WHO). Eastern Mediterranean Regional Office. Obesity. Geneva: WHO; 2017.
4. Rahim HF, Sibai A, Khader Y, Hwalla N, Fadhl I, Alsiyahi H, et al. Non communicable diseases in the Arab world. Lancet. 2014;383(9914):556–67.
5. Riley L, Gathold R, Cowan M, Savin S, Bhatti L, Armstrong T, et al. The World Health Organization STEPSwise Approach to Non-communicable Disease Risk-Factor Surveillance: Methods, Challenges, and Opportunities. AJPH. 2016;106(1):74-8.
6. El-Zanaty F. Egypt Demographic and Health Survey 2014. Cairo (Egypt): Ministry of Health and Population; 2014.
7. Baig M, Gazzar ZZ, Gari MA, Al-Attalali HG, Al-Jedanuni KS, Mesawa AT, et al. Prevalence of obesity and hypertension among University students’ and their knowledge and attitude towards risk factors of Cardiovascular Disease (CVD) in Jeddah, Saudi Arabia. Pak J Med Sci. 2015;31(4):816–20.
8.Nickerk V, Barnard E, Justhinius G. Women College Students Health Aspects, College Student Journal, Project Innovation (Alabama). 2011;45(3):649+.
9. Mohamed HA. Health Practices among Female University Students Regarding Prevention of Reproductive Tract Infections [thesis]. Benha: Benha University; 2013.
10. Hall KS, Moreau C, Trussell J. Determinants of and disparities in reproductive health service use among adolescent and young adult women in the United States, 2002-2008. Am J Public Health. 2012;102(2):359-67.
11. United Nations Population Information Network (POPIN). Guidelines on reproductive health. Geneva: United Nations Population Information Network (POPIN);2002.
12. Poston L, Caleyachetty R, Gunning S, Corvalán C, Uauy R, Herring S, Gillman MW. Preconceptional and maternal obesity: epidemiology and health consequences. The Lancet Diabetes & Endocrinology. 2016;4(12):1025-36.
13. American College of Obstetricians and Gynecologists. ACOG Committee opinion no. 549: obesity in pregnancy. Obstet Gynecol. 2013;121(1):213-7.
14. Dağ ÝO, Dilbaz B. Impact of obesity on infertility in women. J Turk Ger Gynecol Assoc. 2015;16(2):111–7.
15. Metwally M, Ong KJ, Ledger WL, Li TC. Does high body mass index increase the risk of miscarriage after spontaneous and assisted conception? A meta-analysis of the evidence. Fertil Steril. 2008;90(3):714–26.
16. Aune D, Saugstad OD, Henriksen T, Tonstad S. Maternal Body Mass Index and the Risk of Fetal Death, Stillbirth, and Infant Death: A Systematic Review and Meta-analysis. JAMA. 2014;311(15):1536–46.
17. Godfrey KM, Reynolds RM, Prescott SL, Nyirenda M, Jaddoe VWV, Eriksson JG, Broekman BFP. Influence of maternal obesity on the long-term health of offspring. The Lancet Diabetes & Endocrinology. 2017;5(1):53-64.
18. Poobalan AS, Ancott LS, Gurnag T, Smith WC, Bhattacharya S. Obesity as an independent risk factor for elective and emergency caesarean delivery in nulliparous women—systematic review and meta-analysis of cohort studies. Obes Rev. 2009;10(1):28-35.
19. Cardozo E, Pavone ME, Hirshfeld-Cytron JE. Metabolic syndrome and oocyte quality. Trends Endocrinol Metab. 2011;22(3):103-9.
20. Jungheim ES, Schoeller EL, Marquard KL, Louden ED, Schaffer JE, Moley KH. Diet-induced obesity model: abnormal oocytes and persistent growth abnormalities in the offspring. Endocrinology. 2010;151(8):4039-46.
21. Li M, Sloboda DM, Vickers MH. Maternal obesity and developmental programming of metabolic disorders in offspring: evidence from animal models. Experimental Diabetes Research. 2011;2011:9.
22. Whittaker RC. Predicting preschooler obesity at birth: the role of maternal obesity in early pregnancy. Pediatrics. 2004;114(1):e29-36.
23. Bandera EV, John EM. Obesity, Body Composition, and Breast Cancer: An Evolving Science. JAMA Oncol. 2018;4(6):804–5.
24. Ostnad MA, Schmandt RE, Lu KH. Addressing the Role of Obesity in Endometrial Cancer Risk, Prevention, and Treatment. J Clin Oncol. 2016;34(35):4225–30.
25. Connor EV, Raker CA, Clark MA, Stuckey AR. Obesity risk awareness in women with endometrial cancer. Arch Gynecol Obstet. 2017;295(4):965-9.
26. Hanafy S, ELShrakawy O, Abdelbagy M, Tewfik M. Minding the gap in Alexandria: Talking to girls in schools about reproductive health. Population Reference Bureau. 2012 Feb:1-3. Available at: http://www.prb.org/pdf12/girls-encyc-schools-workingpaper.pdf.
27. Martin T. Attitudes and attitude change (Social psychology). London: Macmillan Press LTD; 1997.
28. Twig G, Yaviv G, Levine H, Leiba A, Goldberger N, Derazne E. Body-Mass Index in 2.3 Million Adolescents and Cardiovascular Death in Adulthood. N Engl J Med. 2016;374:2430-40.
29. World Health Organization (WHO). WHO global comparable estimates. WHO Global Info Base on line: Quick Compare. Geneva: WHO; 2002.
30. Foster GD, Makris AP, Bailer BA. Behavioral treatment of obesity. Am J Clin Nut. 2005; 82(1 Suppl):230S-5S.

31. Genena DM, Salama AA. Obesity and eating habits among university Students in Alexandria, Egypt: a cross sectional study. World Journal of Nutrition and Health. 2017;5(3):62-8.

32. Afshin A, Forouzanfar MH, Reitsma MB, Stur P, Estep K, Lee A, et al. Health effects of overweight and obesity in 195 countries over 25 Years. N Engl J Med. 2017;377(1):13-27.

33. Winston GJ, Caesar-Phillips E, Peterson JC, Wells MT, Martinez J, Chen X, et al. Knowledge of the health consequences of obesity among overweight/obese Black and Hispanic adults. Patient Educ Couns. 2014;94(1):123-7.

34. Lee SL, Lee SH. Survey on health-related factors, nutrition knowledge and food habits of college students in Wonju area. Korean J Community Nutr. 2015;20(2):96-108.

35. Awotidebe TO, Adegbehin RA, Fatogbade B, Adeyeye V, Mbada CE, Akinola OT, et al. An assessment of knowledge of Nigerian female undergraduates on obesity as a risk factor for cardiovascular disease in women. Am J Health Res. 2014;2(5-1):50-5.

36. Tazhibi M, Feizi A. Awareness levels about breast cancer risk factors, early warning signs, and screening and therapeutic approaches among Iranian adult women: a large population based study using latent class analysis. Biomed Res Int. 2014; 2014:306-52.

37. Soliman PT, Bassett RL, Wilson EB, Boyd-Rogers S, Schmeler KM, Milam MR, et al. Limited public knowledge of obesity and endometrial cancer risk: what women know. Obstet Gynecol. 2008;112:835-42.

38. Consedine NS, Magai C, Conway F, Neugut AI. Obesity and awareness of obesity as risk factors for breast cancer in six ethnic groups. Obes Res. 2004;12:1680-9.

39. Shrivastava S, Shrivastava P, Ramasamy J. Assessment of knowledge about obesity among students in a medical college in Kancheepuram district, Tamil Nadu. Prog Health Sci. 2013;3(3):54-60.

40. Cardozo ER, Dune TJ, Neff LM, Brocks ME, Ekpo GE, Barnes RB, et al. Knowledge of obesity and its impact on reproductive health outcomes among urban women. J Community Health. 2013;38(2):261-7.