Annals of R.S.C.B., Vol. 25, Issue 7, 2021, pp. 631 - 640
Received 05 May 2021; Accepted 01 June 2021

Overweight and Obesity Prevalence among Adults and Adolescents in Gulshan-E-Iqbal, Karachi, 2018-2020

Sadaf Ibrahim[1], Zuneera Akram[2]*, Samina Sheikh[3], Muzna Zafar[4], Nimra Khan[5], Asma Eraj[6], Hira Khan[7]

1Department of Pharmacology, Faculty of Pharmacy, Ziauddin University, Karachi, Pakistan.
2Department of pharmacology, Faculty of Pharmacy, Baqai Medical University, Karachi, Pakistan.
3Department of Pharmacy Practice,Faculty of Pharmacy,Ziauddin University, Karachi, Pakistan.
4Department of physiology,Altamash Institute of Dental Medicine, Karachi, Pakistan.
5Department of Pharmacy Practice, Baqai institute of pharmaceutical sciences, Baqai medical University, Karachi, Pakistan.
6Jinnah University For Women, Karachi, Pakistan.
7Department of Pharmaceutical Chemistry, Faculty of pharmacy, Hamdard University, Karachi, Pakistan.
*Corresponding Author: Zuneera Akram [Email: dr.zunaira@baqai.edu.pk, Phone: 03323099397]

Abstract

Objective:

The purpose of this study was to determine the prevalence of overweight and obesity, as well as the factors associated with them, among Karachi residents.

Methodology:

This cross-sectional analysis was undertaken from June 2018 to August 2020 under the direction of Dr Saleem. A validated questionnaire was utilized to collect data from 410 individuals, and traditional height and weight evaluation procedures were employed to determine height and weight. South Asian cut-off values for overweight and obesity were 23 BMI (Normal), 25.0 - 29.9 BMI (Overweight), and 30 BMI (Obese). SPSS version 21.0 was used to process the data.

Results:

Men made up 57.31% of the sample, while women made up 42.68%. The 20-39 age group comprised the largest proportion of the population, accounting for 81.21% of the total. Males were found to be more likely to be overweight or obese than females. Around 35.36% of people smoked, 2.19% drank alcool, and 21.89% ate vegetarian, 26.09% ate semi-vegetarian, and 51.46% ate meat. 70.24 percent of patients with co-morbid disorders are overweight or obese, p=0.016. Only 21.70% of the population exercised for at least 30 minutes each day.

Conclusion:

The prevalence of overweight and obesity was found to be high among Karachi residents, more so in men than in women. Sedentary lifestyle factors such as diet and lack of physical activity, smoking, alcohol consumption, and the existence of co-morbidities all contributed to obesity. Individuals may be advised to take preventative measures to avoid becoming overweight or obese.

Keywords: Obesity, Overweight, Body Mass Index, Sedentary lifestyle, Co-morbidities.

Annals of R.S.C.B., Vol. 25, Issue 7, 2021, pp. 631 - 640
Received 05 May 2021; Accepted 01 June 2021

1. Introduction

In developing nations, a rising public health issue (obesity and overweight) has been linked to cultural westernization and accompanying lifestyle changes [1]. Many developed countries are facing a food transition [2,3] in which the level of under nutrition in the face of emerging overweight and obesity is consistently high[2,3]. The prevalence of childhood overweight and obesity in Nigeria and in other Africa countries varied between 0% - 26.7% across the age ranges, based on the measurement approaches used [4-13]. Different methodologies examples are BMI measurement [4,6,7] versus bio-electrical impedance [5] versus waist circumference [8], and differences in definition by WHO 2007 [4,6] versus International Obesity Task Force (IOTF) [7] versus National Centre for Health Statistics (NCHS) [4].

During infancy and adolescence complications from overweight and obesity may continue into adulthood and the risk of morbidity and mortality may be increased later in life [14, 15]. This involves the occurrence of high blood pressure and the resulting risk of cardiovascular morbidity and early death [16, 17]. The prevention and treatment of childhood overweight and obesity has been a significant focal point of pediatric science and clinical care because of these complications.[15]

Environmental and genetic variables affected the incidence of overweight and obesity [15,18,19], while some consistency was seen [20]. In developed countries particularly, children who are born into a high-income household, higher levels of maternal schooling, inadequate physical activity, female gender and race are the main risk factors.[21,22] Prenatal factors such as motherly gestational diabetes and foetal nutrition are significant, however [15] Physical activity, TV watching, and socioeconomic family status may have interdependent trends but few research in Nigeria explored the effect of television involvement or absence in the individual's sleeping area and the amount of hours spent on the screen are the prevalence of overweight and obesity. Moreover, there were contradictory consequences with such risk factors such as family socioeconomic status and race [22–24].

Early identification of childhood risk factors may serve as a motivation for weight loss [25]. Overweight and obesity are best addressed in childhood via counseling and intervention, which may help reduce the short- and long-term effects of obesity, as well as help dismantle the juvenile and adult care monitoring systems. [26]. The purpose of this study was to examine overweight and obesity threats among residents of Karachi, Pakistan's City of Lights, and to identify potential influence factors based on a large epidemiology survey conducted in Karachi, which will result in policy development for the city's population regarding obesity management.

2. Methodology

2.1 Sample

The research was performed in June 2018 - August 2020 in the residents of Gulshan town, city of Karachi, Pakistan under the supervision of Dr. Saleem as a cross-sectional sample of 410 healthy individuals of both sexes aged 20-80.

2.2 Ethics

The research was carried out with the official permission of Dr. Saleem and Baqai Institute of Pharmaceutical Sciences Ethical Board. In this study, the conditions for individuals informed consent is

waived because there was no prior contact with the subject

2.3 Study Plan and methodology

During the study there was no participation of any therapy or treatment, so participants of the test were not harmed. The subject ID number has been used to identify the subject and the subject ID has been kept confidential and has not been published in a particular manner either before or after that analysis of the database. The data on the subject were also kept secret.

Those men and women who spontaneously agreed to take BMI steps for general medical examinations during the time of their hospital visits were analyzed in the course of this research by a total of 410 (age range 20-80). In order to capture the data using a consecutive process, sampling was done.

2.4 Exclusion Criteria

Individuals under the age of 20 and above the age of 80 are not obliged to participate in this phase of the research, nor are they required to take any medication for obesity or hormone replacement therapy. Anyone having a history of cancer, liver or renal disease, or a parathyroid-related condition has also been eliminated. Additionally, the study excluded pregnant or nursing moms.

2.5 Data Collection

Depending on gender, age and height, weight, BMI status and food intake (Vegetarian, Semi-vegetarian, non vegetarian diet), data have been recorded. Data were also focused on the alcohol and smoking, activity levels, and other current co-morbidities.

The height and weight anthropometric data are measured by Floor type weighing machine. The measured height with standiometer, with precision of 1 mm and by the use of Weight Balance with the consistency of 0.05 kg “weighing machine " The body mass Index is dependent on weight and height. The BMI formula may be written as: weight (kg) / height (m^2)

2.6 Entering and Processing Results.

Microsoft Excel® and the Social Science Processing Package 21 have been used for data entering and processing (SPSS Inc., Chicago, IL, USA). Variables were grouped according to gender, age, dietary status lifestyle and BMI status, to promote study. Individuals were classified according to their age into three subgroups (Group 1: 20-39 years, Group 2: 40-59 years). Group 3: Individuals aged 60 and above. The Life style status contains multiple variables including dietary status which was classificated in the vegetarian, semi-vegetarian and non-vegetarian category. Physical activity status, smoking or alcohol consumption status. Presence or absence of co morbidities factor were also assessed with respect to BMI. In all statistical analyses, the statistical significance was calculated at the basis of p-value.

2.7 Body Mass Index Classifications

Weight, height and BMI were collected on site during the hospital visit. Individuals are categorized as meeting the conditions specified by the WHO:

Underweight (<18.5 kg/m^2),

Annals of R.S.C.B., Vol. 25, Issue 7, 2021, pp. 631 - 640
Received 05 May 2021; Accepted 01 June 2021

Healthy weight (18.5 – 24.9 kg/m^2),

Overweight (25.0–29.9 kg/m^2), and

Obese (30.0 kg/m^2–above). [27-29]

3. Results

The number and proportion of individuals in various age groups were presented according to gender in the table 1. Individuals aged 20-39 were the most numerous group (81.21%), led by individual's ≥60 years, and ≥40-59 year's age group. There is the least number of individuals in group 40-59. Individuals were on average 46.79 ± 22.15 years old. The survey contained 42.68 % females of average aged 48.19 ± 17.09 and 57.31% male of average aged 45.02 ± 24.98.

		Age →	**20-39**	**40-59**	**≥60**	**Total**
Gender	Male	Count (n)	196	26	13	235
		Percentage (%)	83.40%	11.06%	5.53%	57.31 %
	Female	Count (n)	137	8	30	175
		Percentage (%)	78.28%	4.57%	17.14%	42.68 %
Total		Count (n)	333	34	43	410
		Percentage (%)	81.21%	8.3%	10.5%	

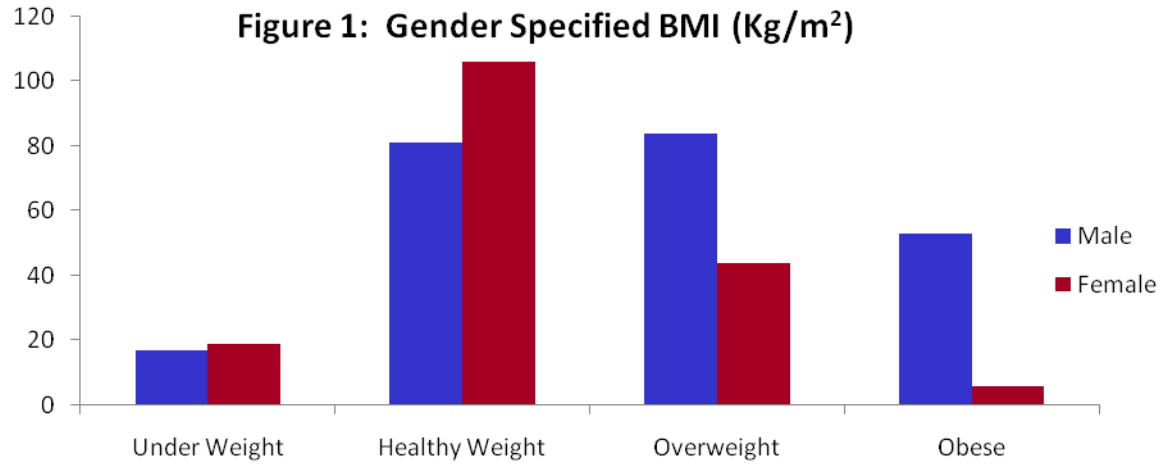
Individual's classification by BMI provides varying outcomes for different reference values. The findings reveal that the study of 410 individuals was divided into four groups dependent on the BMI status. For the WHO classification the obese figure is 23.83%, the overweight ratio is 29.53%, and the under weight ratio is 19.43% (Table 2).

Females were substantially underweight than males. In 34.46% of men and 66.86% of females healthy weight was observed, while for males the overweight and obese ratio was 35.74% and 22.55% respectively, where as for females it was 25.14%, and 3.4%. Men are more vulnerable to overweight and females are more susceptible to underweight. The prevalence ratio definition and logistical regression models have shown that males are more likely to suffer obese and overweight. The healthy weight ratio of the males was lower than of females and considerably higher (35.74% vs. 25.14%) in case of underweight category (Table 2, Figure-1).

Table 2: Prevalence (n) between persons with underweight, over weighted or obese depending on WHO standards

WHO BMI Standards →			**Under Weight**	**Healthy Weight**	**Over Weight**	**Obese**	**Total**	**p-value**
Gender	Male	Count	17	81	84	53	235	0.000
		%	7.23%	34.46%	35.74%	22.55 %		
	Female	Count	19	106	44	6	175	
		%	10.8%	60.57%	25.14%	3.4%		
Total		Count	36	187	128	59	410	
		%	8.78%	45.61%	32.21%	14.39 %		

Annals of R.S.C.B., Vol. 25, Issue 7, 2021, pp. 631 - 640
Received 05 May 2021; Accepted 01 June 2021



Baseline feature in table III, demonstrates the trends of the gender-stratified population of the study. Alcohol intake and smoking were both significantly higher in men as compared to women. Physical activity registered to women was significantly lower than to men. An intake of semi-vegetarian food was significantly higher in females than to men where as non-vegetarian and vegetarian food intakes were found to be higher in men than in women. Presence of co morbidities revealed that men suffer the most with co morbidities than females

Table III: Base line characteristics

Variable	Total population		Females		Males		P-value
Life style characteristics, n (%)							
Non- Smokers	**265**	64.63%	**141**	80.57%	**124**	38.15%	0.000
Smokers	**145**	35.36%	**34**	19.42%	**111**	47.23%	
No Alcohol consumption	**401**	97.80%	**173**	98.85%	**228**	97.02%	0.001
Alcohol consumption	**09**	2.19%	**02**	1.14%	**07**	2.97%	
No Exercise	**321**	78.29%	**159**	90.85%	**162**	68.93%	0.003
Exercise Present	**89**	21.70%	**16**	9.14%	**73**	31.06%	
Vegetarian Diet	**92**	21.89%	**38**	21.71%	**54**	22.98%	0.006
Semi-Vegetarian Diet	**107**	26.09%	**81**	46.28%	**26**	11.06%	
Non-Vegetarian Diet	**211**	51.46%	**56**	32%	**155**	65.96%	
Co morbidities	**288**	70.24%	**102**	58.28%	**186**	79.14%	0.002
No Co morbidities	**122**	29.75%	**73**	41.71%	**49**	20.85%	

Annals of R.S.C.B., Vol. 25, Issue 7, 2021, pp. 631 - 640
Received 05 May 2021; Accepted 01 June 2021

Table IV: Association with the prevalence of overweight and obesity between the chosen variables

BMI →		Under Weight		Healthy Weight		Over Weight		Obese		Total	*P*-Value
Age (Years)	20-39	**(21)**	6.3%	**(166)**	49.8%	**(108)**	32.4%	**(38)**	11.4%	333	0.000
	40-59	**(03)**	8.8%	**(06)**	17.6%	**(11)**	32.3%	**(14)**	41.2%	34	
	≥60	**(12)**	27.9%	**(15)**	34.9%	**(09)**	20.9%	**(07)**	16.3%	43	
Smoker	Yes	**(24)**	16.5%	**(36)**	24.8%	**(75)**	51.7%	**(10)**	6.9%	145	<0.001
	No	**(12)**	4.5%	**(151)**	57.0%	**(53)**	20.0%	**(49)**	18.5%	265	
Alcohol	Yes	**(01)**	11.1%	**(01)**	11.1%	**(03)**	33.3%	**(04)**	44.4%	09	0.003
	No	**(35)**	8.7%	**(186)**	46.4%	**(125)**	31.2%	**(55)**	13.7%	401	
Diet	Vegetarian	**(17)**	18.4%	**(48)**	52.1%	**(11)**	11.9%	**(16)**	17.3%	92	0.000
	Semi-Vegetarian	**(11)**	10.2%	**(67)**	64.4%	**(17)**	15.8%	**(12)**	11.2%	107	
	Non-Vegetarian	**(8)**	3.7%	**(72)**	34.1%	**(100)**	47.3%	**(31)**	14.6%	211	
Exercise	Yes	**(05)**	5.6%	**(22)**	24.7%	**(28)**	31.5%	**(34)**	38.2%	89	0.161
	No	**(31)**	9.6%	**(165)**	51.4%	**(100)**	31.1%	**(25)**	7.8%	321	
Co morbidities	Yes	**(20)**	6.9%	**(123)**	42.7%	**(93)**	13.5%	**(52)**	18.1%	288	
No Co morbidities	No	**(16)**	13.1%	**(64)**	52.4%	**(35)**	28.7%	**(07)**	5.7%	122	0.016

The table IV below shows the connection between the obesity and overweight prevalence rates and the selected socio-demographic factors for people in Gulshan-e-Iqbal, Karachi. Overweight and obesity for age

group ≥60 (p = 0.000) and individuals who smoked (p <0.001) and drink alcohol is (p = 0.003).The prevalence of overweight and obesity among the individuals with a semi vegetarian diet was also substantially higher (p = 0.000). There was no big disparity, however (Vegetarian to non vegetarian) or exercise (p=0.161), between overweight and obesity and the healthy and underweight individuals. The prevalence of overweight and obesity among the individuals with co morbidities is (50.35%, *p*= 0.016)

4. Discussion:

Overweight and Obesity, which ranges from 15% to 60% for adults, is considered to be a problem in wellbeing around the globe. [27-28] Over the last two decades, Asian developing countries have been particularly exposed to this grave public health hazard. While updated population-based statistics on adult obesity prevalence in Pakistan are lacking, there have been a few regional studies with adults that indicate an increase in overweight and obesity. [30-34]

Our results on overweight (29.5%) and obesity (23.9%) are higher to previous studies on the populations of China. [35-37] Studies in Canada,[38] USA,[39] Greece,[40] Korea,[41] Turkey [42] and England,[43] showed that the prevalence rates are lower which confirms that the burden of obesity differs between countries due to socioeconomic and environmental shifts (e.g., climate, diet, physical activity, etc.). In an urban Karachi survey, 28 % of overweight/obesity were seen, mean while with the BMI being held as a cutoff point at 25.0 kg/m^2.[34] A further research by Khan et al. reported 4.8% obesity prevalence in Balochistani adults; [30] 8.0% obesity rate in Peshawari adults, [31] and overall 25.0% of adults reported overweight or obese in Pakistan.[44] However, the cut-off point for an irregular BMI was used in this analysis is 23.0 kg/m^2. Some of the regional difference was also seen in Pakistani adults about the prevalence of overweight (29.0%–46%) and obesity (20.8%–27.85%). [32-33] The variation in race, age and use of BMI cut-off points suggested for the Asia-Pacific region by the WHO can explain this difference in contrast with the international cutoff for obesity definition.

Overweight and obesity in adults of the age group ≥80 (i.e. aged 80–90) were both greater and lesser in the youngest Pakistani adults (i.e. ages from 30–39). The percentages in women were significantly lower than in men in all ages. In a preliminary analysis in Pakistan, different trends were observed. [44] Some surveys showed the lowest obesity rates in Turks, [45] Iranians, [46] and Omani [47] for those under the age of 30 and the lowest obesity for aged between 30 and 60. The difference in findings also emerged from an analysis of the Saudi adult population [48] in line with previous research. [35,40,45,46,47,48] Pakistani men had a mean BMI higher than women and more obese than women (e.g., in the overall sample, obesity rates were 22.55% in men vs. 3.4% in women which is different from the study conducted in Libya in which women were slightly more likely to be obese than men.[49-50] This may be because men in Pakistan always live in a sedentary way of life. Being limited in activites after desk job and doing less physical exercise may also be the key cause for a weight increase. The significance of the consequences for overweight and obesity according to their age and gender has been demonstrated by different literature. [30,44,46] Parallel to this, the logistical return analysis demonstrates that adults (≥60 years old) are at greater risk of overweight than their peers.

T he WHO has suggested using cutoff values of 85th and 95th percentiles, which correspond to a BMI of 25 kg/m^2 and 30 kg/m^2, respectively, for determining overweight and obesity in the adult population. According to our study's overall results, a BMI of 25 kg/m2 corresponds to a high level of obesity in both sexes, and a BMI of 30 kg/m2 relates to a high level of obesity in men, but a low one in women. Because BMI is used to determine obesity but does not offer information on body fat percentage, overweight/obesity were not classified as a measure with body fat percentage.

In the population of Pakistan's adults, there is a high incidence of overweight and obesity. Overweight and obesity are most likely for elderly (≥60 years) persons in this group. In particular, Pakistani citizen of Gulshan-e-Iqbal, Karachi are in trouble, which are smoker individuals and having co morbidities. These results indicate that harmful practices, such as excess food and an imbalance diet, sedentary behaviour, and

smoking, [51,52] must be avoided in order to improve the wellbeing of adults. Global promotions should also be introduced to reduce potential obesity epidemics and obesity-related chronic diseases.

Conclusion:

The incidence of overweight and obesity was shown to be associated with age, alcohol use, co morbidity, and nutritional status among residents of Gulshan-e-Iqbal, Karachi. As a result, it is advised that individuals, particularly males over the age of 60, engage in preventative programmes aimed at preventing overweight and obesity.

References:

1. Musa DI, Toriola AL, Monyeki MA, Lawal B. Prevalence of childhood and adolescent overweight and obesity in Benue State, Nigeria. Tropical Medicine & International Health 2012; 17: 1369–75.
2. Jafar TH, Qadri Z, Islam M, Hatcher J, Bhutta ZA, Chaturvedi N. Rise in childhood obesity with persistently high rates of undernutrition among urban school-aged Indo-Asian children. Arch Dis Child. 2008; 93: 373–8.
3. Kapoor SK, Anand K. Nutritional transition: a public health challenge in developing countries. J Epidemiol Community Health 2002;56:804–805.
4. Ayoola O, Ebersole K, Omotade OO, Tayo BO, Brieger WR, Salami K, et al. Relative height and weight among children and adolescents of rural southwestern Nigeria. Ann Hum Biol. 2009; 36: 388–99.
5. Owa JA, Adejuyigbe O. Fat mass, fat mass percentage, body mass index, and mid-upper arm circumference in a healthy population of Nigeria children. J Trop Pediatr. 1997; 43: 13–19.
6. Fetuga MB, Ogunlesi TA, Adekanmbi AF, Alabi AD. Nutritional status of semi-urban Nigerian school children using the 2007 WHO reference population. West Afr J Med. 2011; 30: 331–6.
7. Adegoke SA, Olowu WA, Adeodu OO, Elusiyan JBE, Dedeke IOF. Prevalence of overweight and obesity among children in Ile-Ife, South-Western Nigeria. West Afr J Med. 2009; 28: 216–21.
8. Senbanjo IO, Njokanma OF, Oshikoya KA. Waist circumference values of Nigerian children and adolescents. Ann Nutr Metab. 2009; 54: 145–50.
9. Armstrong MEG, Lambert MI, Lambert EV. Secular trends in the prevalence of stunting, overweight and obesity among South African children (1994–2004). Eur J Clin Nutr. 2011; 65: 835–40.
10. Intiful FZ, Ogyiri L, Asante M, Mensah AA, Steele-Dsdzie RK, Boateng L. Nutritional status of boarding and non-boarding children in selected schools in the Accra metropolis. Journal of Biology, Agriculture and Healthcare 2013; 3: 156–162.
11. Mohammed H, Vuvor F. Prevalence of childhood overweight/obesity in basic school in Accra. Ghana Medical Journal 2012; 46: 124–127.
12. Wamba PCF, Oben JE, Cianflone K. Prevalence of overweight, obesity, and thinness in Cameroon urban children and adolescents. J Obes. 2013;2013:737592.
13. Moselakgomo VK, Toriola AL, Shaw BS, Goon DT, Akinyemi O. Body mass index, overweight, and blood pressure among adolescents schoolchildren in Limpopo province, South Africa. Rev Paul Pediatr. 2012; 30: 562–9.
14. George AB. Obesity: special features. Medical consequences of obesity. J Clin Endocrinol Metab. 2004; 89: 2583–9.
15. Gahagan S. Overweight and Obesity. In: Kliegman RM, Stanton BF, Geme JW, Schor NF, Behrman RE, editors. Nelson Textbook of Paediatrics.19th edition. Philadephia, Saunders, 2011.p.179–87.
16. The Seventh Report of the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure (The JNC7 Report). JAMA 2003; 289: 2560–2572.

17. Ejike CE, Ugwu C. Hyperbolic relationship between blood pressure and body mass index in a Nigerian adolescent population. http://www.webmedcentral.com. Accessed on 24th Dec, 2011.
18. Sidik S.M, Ahmad R. Childhood Obesity: Contributing Factors, Consequences and Intervention. Mal J Nutr 2004; 10: 13–22.
19. Onyemelukwe .G.C. Trend of communicable diseases in Nigeria. http: // int. search.tb .ask. com/ search/GGmain.jhtml. accessed 26/10/15.
20. Chen J, Weiss S, Heyman M.B, Lustig R. Risk Factors for Obesity and High Blood Pressure in Chinese American Children: Maternal Acculturation and Children's Food Choices. J Immigrant Minority Health 2011; 13:268–275.
21. Crispim P.A.A, Peixoto M.R.G, Jardim P. C.B.V. Risk Factors Associated with High Blood Pressure in Two- to Five-Year-Old Children.
22. Ogden CL, Carroll MD, Curtin LR, et al. Prevalence of overweight and obesity in the United States 1999–2004. JAMA. 2006; 295:1549–1555.
23. Sobal J, Stunkard AJ. Socioeconomic status and obesity: a review of the literature 1989. Psychol Bull. 1989; 105:260–275.
24. Strauss RS, Pollack HA. Epidemic increase in childhood overweight, 1986–1998. JAMA. 2001; 286:2845–2848. pmid:11735760
25. Janjua N.Z, Mahmood B, M. Islam A, Goldenberg R.L. Maternal and Early Childhood Risk Factors for Overweight and Obesity among Low-Income Predominantly Black Children at Age Five Years: A Prospective Cohort Study. Journal of Obesity. 2012; 2012: http://dx.doi.org/10.1155/2012/457173.
26. Dehghan M, Akhtar-Danesh N, Merchant AT. Childhood obesity, prevalence and prevention. Nutrition Journal 2005; 4: 24.
27. James PT, Leach R, Kalamara E, Shayeghi M. The worldwide obesity epidemic. Obes Res. 2001;9(Suppl 4):228S–233S. doi: 10.1038/oby.2001.123.
28. World Health Organization. Controlling the global obesity epidemic: the challenge [Internet] World Health Organization; Geneva: 2008. [cited 2019 Nov 20].
29. Asif M, Aslam M, Altaf S, Atif S, Majid A. Prevalence and Sociodemographic Factors of Overweight and Obesity among Pakistani Adults. J Obes Metab Syndr. 2020 Mar 30; 29(1): 58–66.
30. Khan I, Ul-Haq Z, Taj AS, Iqbal AZ, Basharat S, Shah BH. Prevalence and association of obesity with self-reported comorbidity: a cross-sectional study of 1321 adult participants in Lasbela, Balochistan. Biomed Res Int. 2017;2017:1076923.
31. Khan A, Afridi AK, Safdar M. Prevalence of obesity in the employees of universities, health and research institutions of Peshawar. Pak J Nutr. 2003;2:182–88.
32. Amin F, Fatima SS, Islam N, Gilani AH. Prevalence of obesity and overweight, its clinical markers and associated factors in a high risk South-Asian population. BMC Obes. 2015;2:16.
33. Aslam M, Saeed A, Pasha, GR, Altaf S. Gender differences of body mass index in adults of Pakistan: a case study of Multan city. Pak J Nutr. 2010;9:162–66.
34. Khan FS, Lotia-Farrukh I, Khan AJ, Siddiqui ST, Sajun SZ, Malik AA, et al. The burden of non-communicable disease in transition communities in an Asian megacity: baseline findings from a cohort study in Karachi, Pakistan. PLoS One. 2013;8:e56008.
35. Jia WP, Xiang KS, Chen L, Lu JX, Wu YM. Epidemiological study on obesity and its comorbidities in urban Chinese older than 20 years of age in Shanghai, China. Obes Rev. 2002;3:157–65.
36. Hou X, Jia W, Bao Y, Lu H, Jiang S, Zuo Y, et al. Risk factors for overweight and obesity, and changes in body mass index of Chinese adults in Shanghai. BMC Public Health. 2008;8:389.
37. Wang W, Wang K, Li T. A study on the epidemiological characteristics of obesity in Chinese Adults.

Zhonghua Liu Xing Bing Xue Za Zhi. 2001;22:129–32.
38. Bélanger-Ducharme F,Tremblay A. Prevalence of obesity in Canada.Obes Rev. 2005;6:183–6.
39. Befort CA, Nazir N, Perri MG. Prevalence of obesity among adults from rural and urban areas of the United States: findings from NHANES (2005-2008) J Rural Health. 2012;28:392–7.
40. Manios Y, Panagiotakos DB, Pitsavos C, Polychronopoulos E, Stefanadis C. Implication of socio-economic status on the prevalence of overweight and obesity in Greek adults: the ATTICA study. Health Policy. 2005;74:224–32.
41. Kim DM, Ahn CW, Nam SY. Prevalence of obesity in Korea. Obes Rev. 2005;6:117–21.
42. Yabanci N, Gocgeldi E, Simsek I, Kilic S. Prevalence of obesity, abdominal obesity and the associated factors among a group of Turkish adults. Pak J Med Sci. 2010;26:21–5.
43. Rennie KL, Jebb SA. Prevalence of obesity in Great Britain. Obes Rev. 2005;6:11–2
44. Jafar TH, Chaturvedi N, Pappas G. Prevalence of overweight and obesity and their association with hypertension and diabetes mellitus in an Indo-Asian population. CMAJ. 2006;175:1071–7.
45.Yabanci N, Gocgeldi E, Simsek I, Kilic S. Prevalence of obesity, abdominal obesity and the associated factors among a group of Turkish adults. Pak J Med Sci. 2010;26:21–5.
46. Hajian-Tilaki KO, Heidari B. Prevalence of obesity, central obesity and the associated factors in urban population aged 20-70 years, in the north of Iran: a population-based study and regression approach. Obes Rev. 2007;8:3–10.
47. Al-Riyami AA, Afifi MM. Prevalence and correlates of obesity and central obesity among Omani adults. Saudi Med J. 2003;24:641–6.
48. Alsaif MA, Hakim IA, Harris RB, Alduwaihy M, Al-Rubeaan K, Al-Nuaim AR, et al. Prevalence and risk factors of obesity and overweight in adult Saudi population. Nutr Res. 2002;22:1243–52.
49. H Lemamsha , G Randhawa , C Papadopoulos. Prevalence of Overweight and Obesity among Libyan Men and Women. Biomed Res Int. 2019 Jul 15;2019:8531360.
50. Shiwen Yu , Liying Xing , Zhi Du , Yuanmeng Tian , Li Jing , Han Yan , Min Lin , Boqiang Zhang , Shuang Liu , Yaping Pan , Chen Li. Prevalence of Obesity and Associated Risk Factors and Cardiometabolic Comorbidities in Rural Northeast China. Biomed Res Int. 2019 Jul 25;2019:6509083.
51. Baalbaki R, Itani L, El Kebbi L, Dehni R, Abbas N, Farsakouri R, Awad D, Tannir H, Kreidieh D, El Masri D, El Ghoch M. Association between smoking hookahs (shishas) and higher risk of obesity: a systematic review of population-based studies. Journal of cardiovascular development and disease. 2019 Jun;6(2):23.
52. Ibrahim S, Akram Z, Noreen A, Baig MT, Sheikh S, Huma A, Jabeen A, Lodhi M, Khan SA, Hudda A, Shahid U. Overweight and Obesity Prevalence and Predictors in People Living in Karachi. Journal of Pharmaceutical Research International. 2021 Jun 15:194-202.