RESEARCH ARTICLE

PATTERN OF OBESITY AND SOCIODEMOGRAPHIC CHARACTERISTICS FOR NUTRITION CLINIC CLIENTS IN BASRA, IRAQ.

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Manuscript Info	Abstract
	Background: Obesity and overweight is a major public health concern. This study determines the prevalence of overweight and obesity classes among adult nutrition clinic client in Basra, Iraq, and the how sociodemographic characteristics relate to their BMI. **Methods:** An observational cross-sectional study was conducted. The sample size was 1464 clients, of which 1007 were included. Weight and height was reported, and BMI was calculated; sociodemographic characteristics were taken. Data was standardly categorized. **Results:** Of the study population, 27% were overweight and 73% were obese; from the obese, 28% were class I, 21% were class II, and 24% were class III. Females had a higher BMI than males ($34.32 \text{ Kg/m}^2 \pm 6.50$ SD and $36.32 \text{ Kg/m}^2 \pm 8.31$ SD, respectively). Unlike men, women also face a shift from overweight to higher BMI classes with age. Extreme obesity was most prevalent among the unemployed (36.21%), but least prevalent among the employed (14.34%). Overweight was the most prevalent for students (50%). **Discussion:** The observed shift in BMI for females can be attributed to pregnancies and the sedentary lifestyle of middle eastern women. Higher BMI classifications are linked to lower educational levels and unemployment, two indicators of low socioeconomic class; the study thus supports the argument that obesity and overweight are a concern to all socioeconomic backgrounds. The results will help shape preventive and curative administrative measures. **

Introduction:-
The increasing prevalence of overweight and obesity has become a major public health concern in both developed and developing countries. [1]

Worldwide prevalence of obesity has more than doubled between 1980 and 2014. In 2014, more than 39% of adults (38% of men and 40% of women) were overweight, while 13% of adults were obese (11% of men and 15% of women) [2].

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In 2000, for the first time in recorded history, the prevalence of overweight and obesity exceeded that of underweight [3]. Nowadays, most of the world's population live in countries where overweight and obesity kills more people than underweight [2]. Obesity is widely regarded as a pandemic with potentially disastrous consequences for human health; for instance, overweight and obesity is linked to higher mortality rates and elevated risk of cardiovascular diseases [4,5,6].

According to WHO, overweight and obesity are defined as abnormal or excessive fat accumulation that may impair health [2]. Overweight can be specifically defined as a state in which the weight exceeds a standard based on height, while obesity can be defined as a condition of excessive fatness, either generalized or localized [7].

BMI (or Quetelet index) is an anthropometric measurement most widely used to assess total body fatness, by means of weight and height. Due to its simplicity, BMI has widely been used in epidemiological studies and is recommended as a screening tool in the clinical assessment of obesity [8]. BMI has also long been recognized as a predictor of morbidity and mortality and as indicator of over-nutrition and undernutrition [7].

The fundamental cause of obesity and overweight is an energy imbalance between calories consumed and calories expended. Globally, there has been an increased intake of energy-dense foods that are high in fat; and an increase in physical inactivity due to the increasingly sedentary nature of many forms of work, changing modes of transportation, and increasing urbanization [4,6].

Furthermore, obesity is metabolically unhealthy and is found to cause health risks: cardiovascular diseases; metabolic syndromes, mainly type 2 diabetes, hypertension and high-blood-cholesterol; cancers like endometrial, breast, ovarian, prostate, liver, gallbladder, kidney, and colon cancer; mechanical disorders like osteoarthritis, urinary stress incontinence, and varicose veins; hormonal disturbance; skin infections like groin and sub-mammary candidiasis, and hidradenitis; gallbladder disease; infertility; pregnancy complications; and restricted ventilation. Psychological morbidity, socioeconomic disadvantages, and increased surgical risks are other complications associated with obesity. Generally, these effects tend to worsen as the degree of obesity increases [2,6,9].

Due to the adverse effects and unfavorable consequences of obesity, treating obesity at individual and community-levels has receiving renowned attention worldwide [5,6]. Overweight and obesity –and their related non-communicable diseases– are largely preventable by controlling certain dietary and physical activity patterns, which are often the result of environmental and societal changes associated with development and lack of supportive policies in sectors like health, agriculture, transport, urban planning, environment, food processing, distribution, marketing, and education [2].

When treating patients, selecting the appropriate treatment strategy depends on the goals and health risks of the patient. Weight loss requires lifestyle modification, integration of nutritional changes with exercise, behavioral modification, nutritional education, psychological support and family involvement. When all these comprehensive approaches fail, pharmacotherapy can be added. Moreover, bariatric surgery can be considered for class III obese patients or class II obese patients with comorbidities, given the failure of a complete comprehensive program [7,10].

The objectives of this study were to estimate the prevalence of overweight and obesity classes among adults, and investigate some of their sociodemographic determinants. The results of the study will form a baseline for future examination of secular trends, and will serve for administrative purposes in planning for preventive or curative measures prioritization and societal supportive policies implementations.

Methods:-

This observational cross-sectional study was carried out to assess the prevalence of overweight and classes of obesity among adult overweight and obese clients in the only nutrition clinic during study period in the Basra governorate, located in the Sader Teaching Hospital and administrated through the Health Directorate of Basra. The Health Directorate of Basra holds the rights for all data used, permission of data use was issued without stating names or any information that might identify clients. The study was conducted in accordance with the Declaration of Helsinki, and the used protocol was approved by the Ethics Committee of the Health Directorate of Basra, Iraqi Ministry of Health (Issuance Number: 403, 21/8/2017).

The study population compromises from a total of 1464 nutrition clinic attendees in the years of 2014 to 2017.Some nutrition clinic attendees are referred from medical and surgical departments/clinics in the hospital or primary health care centers, whilst others are self-referred. Clients attend the clinic for weight management and assessment, to get customized nutrition plans, or for nutritional disease control aid. Clients whose ages less than 18, pregnant, those with incomplete data, and those underweight or normal were excluded from the study; only adult overweight and obese clients with complete data were included.

Data was collected using a data-entry form designed by the researchers, and sociodemographic information were obtained from the records which are originally filled by one of the researchers. The researchers and their trained assistants measured the weight and height. BMI was calculated using the equation:

$$BMI = Weight\ (Kg)/\ Height\ {}^{\wedge}2(M), \qquad\qquad (1)$$

Overweight and obesity classes were identified using the NIH and NICE guidelines, as shown in Table 1 [10,11].

**Table 1:-**BMI classifications, according to the NIH and NICE guidelines [10,11].

Classification	BMI
Underweight	<18.5 kg/m2
Normal or Healthy weight	18.5–24.9 kg/m2
Overweight	25–29.9 kg/m2
Obesity (Class I)	30–34.9 kg/m2
Obesity (Class II)	35–39.9 kg/m2
Extreme or morbid obesity (Class IV)	≥40 kg/m2

Data was entered and analyzed using Microsoft Access 2016 computer software on Microsoft Windows 10 and all tables and results were produced using a computer.

Results:-
From the 1464 clients attending the nutrition clinic from 2014-2017, 4% were underweight, 14% were normal, 22% were overweight, and 60% were obese as 23% had class I obesity, 18% had class II obesity, and 19% had class III obesity. Refer to figure 1.
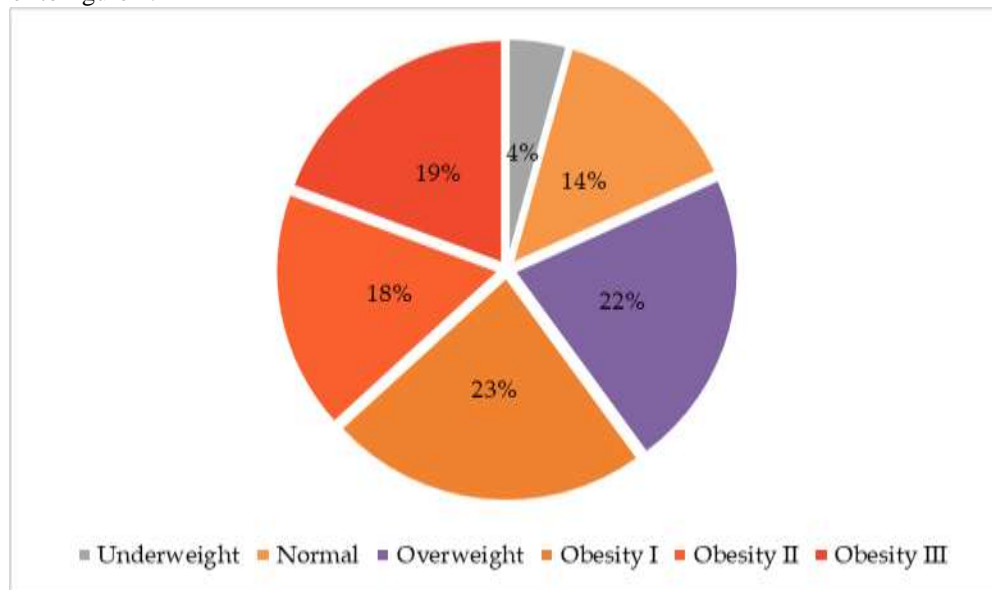
Figure 1:-BMI classifications among study population, regardless of exclusion criteria.

From 1007 overweight and obese client, 27% were overweight and 73% were obese. From that obese portion, 28% had class I obesity,21% had class II, and 24%had III, as shown in Figure 2.
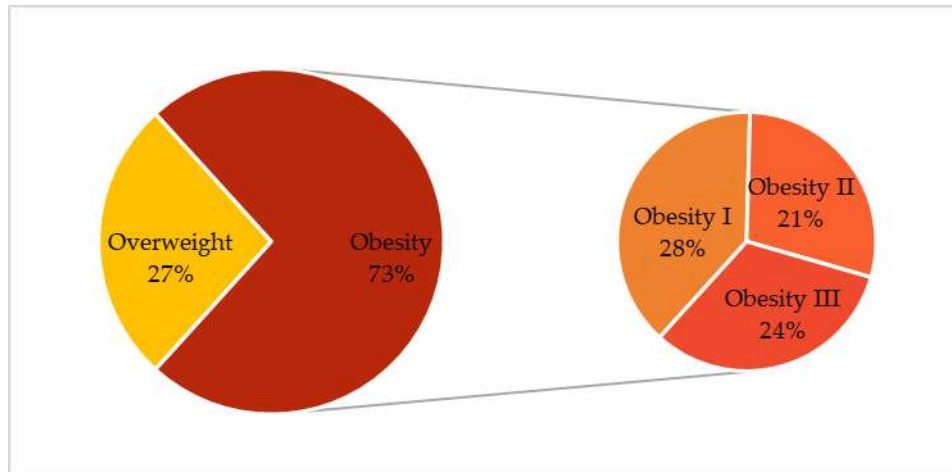
Figure 2:-BMI classification among overweight and obese clients.

Overweight and obese male clients had an average weight of 99.35 Kg $\pm$ 20.34 Standard Deviation (SD), while females had a mean weight of 90.03 Kg $\pm$ 19.64 SD. Mean height was 169.99 cm $\pm$ 7.71 SD for males, and 157.62 cm $\pm$ 6.80 SD for females. Also, mean BMI was 34.32 Kg/m^2 $\pm$ 6.50 SD for males and 36.32 Kg/m^2 $\pm$ 8.31 SD for females. Table 1 summarizes these findings.

Table 1:- Mean anthropometric measurement of overweight and obese study population.

Mean Anthropometric Measurement	Males	Females
Weight (Kg)	99.35 $\pm$ 20.34 SD	90.03 $\pm$ 19.64 SD
Height (cm)	169.99 $\pm$ 7.71 SD	157.62 $\pm$ 6.80 SD
BMI (Kg/m^2)	34.32 $\pm$ 6.50 SD	36.32 $\pm$ 8.31 SD

Table 2:- Percentage of overweight and obese for age and sex of study population.

Age (yrs.)	Overweight		Obese I		Obese II		Obese III		Total	
	M	F	M	F	M	F	M	F	M	F
18-39	25 27.5%	121 30.3%	38 41.7%	100 25.1%	14 15.4%	84 21%	14 15.4%	94 23.6%	91 100%	399 100%
40-59	29 24.2%	57 17.7%	46 38.3%	86 26.6%	28 23.3%	82 25.4%	17 14.2%	98 30.3%	120 100%	323 100%
60	7 28.0%	8 16.3%	9 36.0%	15 30.6%	3 12.0%	10 20.4%	6 24%	16 32.7%	25 100%	49 100%
Total	61	186	93	201	45	176	37	208	236	771

Despite their age groups, class I obesity was the most prevalent in the male population. However, BMI classifications for females tend to increases with age: overweight was the most prevalent for females with ages 18-39, while obesity –especially class III– was the most prevalent for women older than 40 years. Table 2 shows the prevalence of overweight and obesity for each age group and sex.

Table 3:-Distribution of overweight and obesity classes against sociodemographic determinants.

Education	Overweight		Obese I		Obese II		Obese III		Total	
Illiterate	8	13.56 %	16	27.12 %	18	30.51 %	17	28.81 %	59	100%
Literate	15	19.23 %	21	26.92 %	15	19.23 %	27	34.62 %	78	100%
Elementary School	23	14.94 %	35	22.73 %	42	27.27 %	54	35.06 %	154	100%
Middle School	30	17.34 %	50	28.9 %	33	19.08 %	60	34.68 %	173	100%
High School	27	22.13 %	38	31.15 %	29	23.77 %	28	22.95 %	122	100%
Higher Education	144	34.2 %	134	31.83 %	84	19.95 %	59	14.01 %	421	100%

Total	247	24.53 %	294	29.2 %	221	21.95 %	245	24.33 %	1007	100%
Occupation	Overweight		Obese I		Obese II		Obese III		Total	
Employed	158	30.62 %	171	33.14 %	113	21.9 %	74	14.34 %	516	100%
Retired	5	20 %	10	40 %	3	12 %	7	28 %	25	100%
Student	19	50 %	5	13.16 %	5	13.16 %	9	23.68 %	38	100%
Unemployed	65	15.19 %	108	25.23 %	100	23.36 %	155	36.21 %	428	100%
Total	247	24.53 %	294	29.2 %	221	21.95 %	245	24.33 %	1007	100%
Marital	Overweight		Obese I		Obese II		Obese III		Total	
Divorced	5	29.41 %	2	11.76 %	6	35.29 %	4	23.53 %	17	100%
Married	173	21.87 %	246	31.1 %	180	22.76 %	192	24.27 %	791	100%
Separate		0 %		0 %		0 %	1	100 %	1	100%
Single	66	35.87 %	41	22.28 %	34	18.48 %	43	23.37 %	184	100%
Widow(er)	3	21.43 %	5	35.71 %	1	7.14 %	5	35.71 %	14	100%
Total	247	24.53 %	294	29.2 %	221	21.95 %	245	24.33 %	1007	100%

This study shows a significant association between higher levels of education and lower BMI values (or lower BMI classifications). Extreme obesity was the most prevalent for literate through middle school education levels –one third of these clients were extremely obese. In contrast, only 14.01% of the clients that have perused higher education were extremely obese; the most prevalent BMI classification for these clients was overweight.

Extreme obesity was most prevalent among the unemployed (36.21%), but the least prevalent among the employed (14.34%); Class I obesity was the most prevalent for the employed (33.14%) and retired clients (40%). In addition, overweight was the most prevalent for students (50%). This analogy shows some relation between the occupation status and BMI classifications.

Overweight was the most prevalent among the single population, class I obesity among the married, class II obesity for the divorced, and class III or I among the widow(er) population –each about one third.

Discussion:-
This observational cross-sectional study discusses the prevalence of overweight and different classes of obesity among adult nutrition clinic clients. Most of the 1464 clients visited the nutrition clinic during study period were obese and few were underweight, which might be due to that high likeliness to complain from overweight or due to the higher prevalence of obesity in the general Iraqi community as compared to underweight (33.5% obesity, 31.9% overweight and underweight) [6,7,12]. About three quarters of the overweight and obese population were obese (1007 clients or 69% of the study population), and the remaining quarter were overweight. The prevalence of Class I obesity was the most prevalent (28%), followed by class III (24%) and class II (21%).

The mean weight was lower for the female study population (90.03 ± 19.64 SD) that for the males (99.35 ± 20.34 SD). Likewise, the mean height of females (157.62 ± 6.80 SD) was less than that of males (169.99 ± 7.71 SD). Consequently, females had higher mean BMI (36.32 ± 8.31 SD) than males (34.32 ± 6.50 SD), and thus higher obesity classes. These differences are comparable to those in the latest Iraqi national survey on general population, for instance, a similar difference in mean height was found between males and females (171.3 and 157.5 cm, respectively) [12].

Class I obesity was the most prevalent for males despite their age, and no significant difference in BMI values was observed for different age groups. The prevalence of higher BMI classifications for females, however, tends to increase with age, that the prevalence of overweight tends to decrease while that of obesity increases. These changes are comparable to studies conducted in a Kuwait, a neighboring country. The changes in BMI classification of females might be attributed to pregnancy, previous literature associates pregnancies with increasing BMI due to changes in height and weight after each pregnancy [13,14]. In addition, increasing BMI is one of the many consequences of the sedentary lifestyle for middle eastern women, a lifestyle described as "a ticking time bomb in lifestyle-related diseases" [15].

The results reveal that higher BMI classifications are linked to lower educational levels, unemployment, and divorce (or widow). These results are comparable to studies of neighboring countries like Saudi Arabia and Iran where the

prevalence of overweight and obesity was greater among women than men, among married persons compared with singles, among the older compared to the younger, and more common with low educational attainment [16,17,18]. Lower educational levels and unemployment are indicators for low socioeconomic class [19]. These results support the argument that obesity has developed into a "pandemic" in developing countries, after being of concern only to the rich in wealthier countries. This outbreak is attributed to globalization: a process that resulted in a wealthier world (increased income for poor countries) overeating on western diets instead of subsisting on traditional ones [20].

We conclude that most of nutrition clinic clients were obese or, less often, overweight. Three quarters of the study population were obese, and obesity classes varied; the rest quarter were overweight. Mean BMI (Kg/m2) was 34.32 ± 6.50 SD for males and 36.32 ± 8.31 SD for females. Females also had a higher tendency for obesity than males, and their BMI classification increases with age, while it doesn't for males. Increments in obesity classes were also found to relate to lower educational level, unemployment, and divorce or widow.

Recommendations:-
Acknowledgments:-

Conflicts of Interest:-
The authors declare no conflict of interest.

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