

Obesity in Libya: a review

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Obesity is a global epidemic resulting in major morbidity and premature death. About 64% of Libyan adults are either overweight or obese, obesity progressively increasing with age, and two times more common among Libyan women than men. Cases of obesity and overweight are increasing in Libya as well as all over the world, with genetic and environmental factors playing a contributory role. With its known significant morbidity and mortality, obesity should draw the attention of the healthcare community, researchers, and policy makers in Libya.

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Overweight and obesity are defined as abnormal or excessive fat accumulation, which impairs health. Body mass index (BMI) is the most widely used diagnostic tool to identify normal, underweight, overweight, or obese individuals. BMI is equal to body weight (kg)/height (m²).

The World Health Organization (WHO) defines overweight as BMI ≥ 25 kg/m², and obesity as BMI ≥ 30 kg/m² (1).

Central obesity refers to the accumulation of excess visceral fat, resulting in increased waist circumference. It is defined as waist circumference >102 cm in men and >88 cm in women (2) or as waist-hip ratio of >0.9 for men and >0.85 for women. Central obesity is strongly correlated with cardiovascular disease and the risk of diabetes. BMI is also accepted as the standard to diagnose overweight and obesity in children aged 2 years or more (3). In children, overweight and obesity are defined as BMI ≥ 85 th and ≥ 95 th percentile, respectively, for age and sex (4).

Obesity is most commonly caused by excessive intake of dietary calories combined with lack of physical activity in genetically susceptible persons.

Epidemiology

In 1997, the WHO formally recognized obesity as a global epidemic, resulting in major morbidity and premature death. According to WHO estimates in 2008, there were 1.5 billion adults who were either obese or overweight. In 2010, more than 40 million children aged 5 or younger were overweight (5). In 2007, Forbes ranked Libya as 78th out of 194 countries in the list of world's fattest countries, with 53.2% of adults aged 15 or older being overweight or obese (6). However, in reality, the

situation is worse as a national survey in 2008–2009 showed that 63.5% of Libyan adults were either overweight or obese (7).

Obesity is rampant in Libya as 30.5% of Libyan adults (7) (Table 1), 16.9% of children aged 5 or younger (8), and 6.1% of children aged between 10 and 18 are obese (9). The rate of obesity progressively increases with age, from 4.2% in those aged between 10 and 12 to 46% in those aged between 55 and 64 (7, 9) (Figs. 1 and 2). The mean BMI in Libyan adults is 27.7 kg/m² (26.4 kg/m² in men and 29 kg/m² in women), and the mean waist circumference is 93.3 cm. There was no significant difference between male and female children with regard to overweight or obesity (9); however, obesity was almost two times more common among Libyan women than men (21.4% vs. 40.1%) (7, 10), whereas overweight was more prevalent among men than women, a trend being observed worldwide (11–13). This is because women tend to lead sedentary lifestyles than men and also because women in Libya indulge in binge eating as they spend much time at home and also attend more social gatherings, which are usually associated with consumption of abundance of food. Also, hormonal factors might play a role in accumulation of fat in women than in men.

The prevalence of obesity is increasing in Libya as well as all over the world. The earliest traceable report on obesity in the general Libyan population was by Rao et al. in 1984 from Tripoli (10), wherein the overall prevalence of obesity among otherwise healthy adults was 12.6% (42.5% in women and 7.7% in men). In comparison, the 2008–2009 survey (7) showed an increase in the prevalence of obesity by 2.42 times, mainly among males (Table 2). We, however, think that the real increase is much more

Table 1. Prevalence of overweight and obesity in different countries

Country	Overweight			Obesity		
	Male (%)	Female (%)	All (%)	Male (%)	Female (%)	All (%)
Libya (7)	36.1	29.7	33	21.4	40.1	30.5
USA 1999–2008 (11)	40.1	28.6	34.2	32.2	35.5	33.8
KSA 1995–2002 (12)	42.4	31.8	36.9	26.4	44	35.6
Tunisia 1997 (13)	23.3	28.2	27.4	6.7	22.7	14.4
Turkey 2001–2002 (13)	46.5	28.6	36.8	16.5	29.4	23.5

than reported as the obesity definition that was adopted by Rao et al. in the 1984 study was $\geq 27 \text{ kg/m}^2$ for males and $\geq 25 \text{ kg/m}^2$ for females, a clear overestimation of the obesity rate, and many patients who were not considered obese by the 2008–2009 definition were reported as obese in the 1984 report. Moreover, unlike the 2008–2009 survey in which the study sample was randomly selected and representative of the whole population, it is unclear whether the control group from which Rao et al. estimated the prevalence of obesity in otherwise healthy Libyans was randomly selected. Nevertheless, we still can make a valid comparison between the percentages of females with $\text{BMI} \geq 25 \text{ kg/m}^2$, which has increased 1.64 times, from 42.5% in 1984 to 69.8% in 2008.

Etiology

Genetic predisposition

Studies of twins suggest the existence of genetic factors in human obesity. The percentage of obesity that can be attributed to genetics varies, depending on the population examined, from 6 to 85% (14). It is postulated that certain ethnic groups, in an equivalent environment, may be more prone to obesity than others (15). This is because of what is called ‘thrifty gene hypothesis’, where the genetic make up of certain ethnic groups gives them the ability to benefit from rare periods of food abundance by storing energy as fat, an ability valued during times of varying food availability but disadvantageous in the modern life, which offers stable food supplies (16). Surprisingly, obesity is much more prevalent in Libyan

adults than in Tunisian adults (7, 13) despite both populations having more or less the same genetic background, which raises the possibility of environmental factors as the main cause of the increased prevalence of adult obesity in Libya.

Diet

Energy intake and composition of diet play a major role in the pathogenesis of obesity. Total calorie consumption has been found to be related to obesity. From the late 1960s to the early 2000s, the average calories available per person per day have increased in Libya (17).

Infant feeding in Libya

Breast-feeding is shown to be associated with a lower risk of overweight. Exclusive breast-feeding during the first 3 or more months of infancy reduces the risk of overweight in childhood (18–20). In Libya, the rate of artificial feeding is between 5.7% and 40.3% (21, 22), and 47.88% of mothers breast-feed their infants for less than 1 month, whereas 28.18% breast-feed their children for 1–3 months (21). This may partially explain the high rate of obesity in children aged 5 or younger in Libya (8).

Libyan diet

Epidemiological data suggest that a diet high in fat is associated with obesity. There is a dearth of recent and nationally representative data on food consumption in Libya.

In 1996, Al-Arbah reported that cereals, oil, and sweeteners provided the largest shares of energy, 41, 12, and 11%, respectively (23). Food and Agriculture Organization

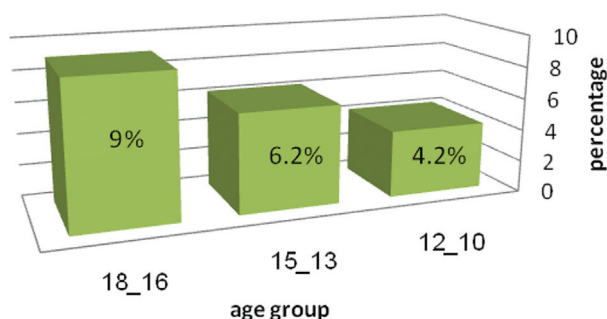
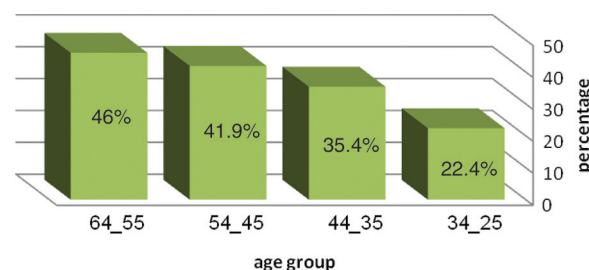
**Fig. 1.** Prevalence of obesity among Libyan children.**Fig. 2.** Prevalence of obesity among Libyan adults.

Table 2. Prevalence of obesity in Libya 1984 vs. 2008

Year	Obesity definition	Survey	Mean BMI (kg/m ²)	Obesity in Males	Obesity in Female	All
1984 (10)	BMI ≥27 M; BMI ≥25 F	Subnational (Tripoli)	NR	7.7%	42.5%	12.6%
2008 (7)	BMI ≥30	National	27.7	21.4%	40.1%	30.5%

(FAO) analysis of yearly production, import, and consumption shows that the staple Libyan diet is wheat (bread, couscous, and pasta). Rice is another major staple in Libya (17). The Libyan diet is low in vegetables and fruits (7). According to the FAO, the quantities of food consumption between 1967 and 2001 have increased 1.5 times, from about 2,061 kcal daily to 3,327 kcal daily, which is well above population energy requirements of 2,144 kcal/capita/day (17). This means a Libyan adult consumes daily an extra 1,183 kcal.

In 2001, according to the FAO, the proportions of main energy sources in the Libyan diet were 62% of carbohydrates, 27% of fat, and 11% of proteins (17). Yet, we think that the contribution of fat to proportion of energy in Libyan diet is higher (24–26) (Table 3), which is comparable with consumption of fat in Western countries. Furthermore, over the last decade or so, Libyan diet has become more influenced by Western food culture, and Libyans are now consuming more diets high in sugar and saturated fat in the form of fast foods (burger, coca, etc.).

In 1978, Jain et al. reported that the average Libyan diet contains about 3,040 kcal, 35% of which is constituted by fats (24).

Another study in 1995 by Najah found that the share of energy from lipids was 29% (25). In 1999, Swedan

estimated that the energy intake by Libyan adults was 2,149 kcal/day for men aged 15–50 years and 2,039 kcal/day for women of the same age range. The percentage of energy provided by protein was 12% and by lipids about 30% (26).

Lack of physical activity

Sedentary lifestyle lowers energy expenditure and promotes weight gain. Worldwide, there has been a marked shift toward less physically demanding work. Currently, about 44% of Libyan adults do not get sufficient exercise (51.7% of women and 36% of men) (7). We think this is mainly because of increasing dependence on mechanical transportation and greater availability of effort-saving equipments domestically. Also, the increase in television viewing time, use of computers, and video games could be other possible contributors to the rise in the prevalence of obesity in Libyan children and adults.

Disease burden

Globally, overweight and obesity are the fifth leading contributors to fatalities (5). Obesity and overweight result in major morbidity and premature death as they are predisposing factors for diabetes mellitus, hypertension, dyslipidemia (27), osteoarthritis (28), certain malignancies (29), and others. The risk of chronic disease

Table 3. Components of Libyan diet

	Total daily caloric consumption (kcal/capita/day)	Carbohydrates (%)	Proteins (%)	Fats (%)
Jain 1978 (24)	3,040	50.42	13.75	35.81
Swedan 2000 (26)	2,039–2,149	58	12	30
FAO 2001 (17)	3,327	62	11	27

Table 4. Prevalence of obesity among Libyan patients with selected medical conditions in comparison to general Libyan population

Group	BMI (kg/m ²)	Obesity		
		Male	Female	All
General (7) population	27.7	21.4%	40.1%	30.5%
Type 2 DM (33)	33.7	52.67%	70.62%	63%
Hypertension (34)	NR	87.4%	87.2%	87.3%
Polycystic ovary disease (35)	34.4	NA	75%	NA
Benign intracranial hypertension (36)	NR	NR	NR	70%

in populations increases progressively from a BMI of 21 kg/m². A high BMI is associated with increased rate of death from all the aforementioned causes and also from cardiovascular disease (30). In the Framingham Study, those with BMI \geq 30 kg/m² at age 40 lived 6 years less than those with lesser BMI, and those with BMI between 25 and 29.9 kg/m² at age 40 lived about 3 years less than healthy subjects (31). Obese subjects also had up to 2.4 times the number of sick leaves as did normal-weight subjects, and the annual drug costs were significantly higher in obese people (32). In Libya, some studies showed that obesity is more prevalent among people with type 2 diabetics (33), hypertensives (34), females with polycystic ovary disease (PCOD) (35), and patients with benign intracranial hypertension (36) than among the general population (Table 4), which indirectly indicates that these diseases are more prevalent among obese than non-obese Libyans.

Conclusion

The prevalence of obesity in Libya is very high in both adults and children, and it has increased dramatically since 1984. The epidemic of obesity is not limited to Libya, but it is a global problem. Obesity is much more prevalent among Libyan women than men, and it increases progressively with age in both sexes. The Libyan diet, which is high in calories and rich in fat, and the lack of physical activity play an important role in the current obesity epidemic in Libya. With its known significant morbidity and mortality, obesity should draw the attention of the healthcare community, researchers, and policy makers in Libya.

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