Original Article

The prevalence of malnutrition and its association with pregnancy outcome among pregnant women in Rafsanjan, Iran, in 2016

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Background: Malnutrition in both its forms of obesity and underweight, particularly in pregnant women, cause maternal mortality and prenatal complications. The aims of this study were to determine the prevalence of malnutrition among pregnant women and its effect on pregnancy outcome, in Rafsanjan, Iran, in 2016.

Materials and Methods: The present cross-sectional study was conducted on 839 pregnant women referred to Niknafs and Ali-Ebn Abitaleb Hospitals in 2016. The subjects were selected by census method. Data [age, pregnancy age, pre-gestational height and weight, and body mass index (BMI)] were collected in the emergency ward and recorded in a checklist. Information on the type of delivery (normal or cesarean section), and the neonate's gender, weight, height, and head circumference at birth were collected in the maternity ward. Data were analyzed using one-way ANOVA, Fisher's exact test, and chi-square test.

Results: This study showed that the prevalence of pregestational overweight & obesity, and underweight was 37.5% and 7.4%, respectively. The prevalence of neonatal LBW and HBW was 5.1% and 3.8%, respectively. In addition, 9.7% of underweight women had LBW neonatals, and 11.8% of women with pregestational obesity had HBW infants (P = 0.039).

Conclusions: The prevalence of obesity in pregnant women was higher than that reported in other studies in different regions of Iran. Therefore, obesity is a warning for health politicians and administrators. Although prenatal care has been able to control neonatal LBW and HBW, although there is a long way until the achievement of the nutritional goals for 2025.

Keywords: Malnutrition, Prevalence, Underweight, Obesity, Pregnancy Outcome, Pregnant Women, Iran.

Introduction

Malnutrition is defined as lack of balance in energy use and consumption of nutrients and can be discussed in the two dimensions of undernutrition and overnutrition. The scope and distribution of both types of malnutrition must be understood so that public health resources can be channeled appropriately. The estimated global prevalence of obesity as 400 million in 2005 and the predicted figure for 2015 was 700 million; however, only 462 million individuals are underweight. These statistics show that in recent years malnutrition has shifted from undernutrition toward overnutrition. These variations have changed the appearance of diseases in developed and developing countries (1, 2). The prevention of obesity in men and women and abdominal obesity in men are the priorities of the health

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plan of governments, although the management of underweight, especially among young women, is also necessary (3). Consequently, most previous studies on malnutrition have focused on obesity and have reported contradictory results regarding the rate of obesity in different provinces of Iran. These studies showed a higher prevalence of obesity in urban areas and especially among women; its prevalence among groups with low and high socioeconomic status was, respectively, 20.2% and 11% (4). In terms of the obesity gene and environment, women are at greater risk of obesity compared to men and obesity in women, especially in reproductive age, results in the mortality of the mother and perinatal mortality (5). Thus, it is a health care issue during pregnancy (6). In 1997-2007, approximately 46% of American women gained more weight during pregnancy than that recommended by the National Academy of Medicine (NAM) (7). Zeal et al. have also reported that about 50.6% of women had been overweight or obese before their pregnancy (8). Duria found that from among 1690 pregnant women, only 5.5% were underweight, and 35.6% were overweight and 19.4% were obese (9). Low weight in mothers before pregnancy causes premature birth and low birth weight (LBW), and increases the risk of perinatal complications, morbidity, and mortality in the mother and infant (6, 9).

One of the most important complications of obesity during pregnancy is premature birth, prolonged labor (6, 10, 11), perinatal mortality, congenital anomalies (12), increased prevalence of cesarean section (C-section), postpartum hemorrhage (6), low five-minute Apgar score (13, 14), its undesirable effects on the later stages of life (15), gestational diabetes, pre-eclampsia (PE), and stillbirths (16). A association has been observed between obesity in the mother and premature birth (17); however, some studies have reported contradictory results (18, 19). A higher prevalence of premature rupture of membrane (PROM), shoulder dystocia, meconium-stained amniotic fluid, fetal arrhythmia, and fetal macrosomia was reported in obese mothers in the study by Avc (20).

Studies on malnutrition in the form of an overweight and underweight appearance, its impact on pregnancy outcome, premature birth, and LBW have reported contradictory results (17, 19). Furthermore, due to the lack of a research on malnutrition in pregnant women in terms of underweight and overweight appearance in Rafsanjan, Iran, the present study was conducted to determine the prevalence of malnutrition and its effect on pregnancy outcome in women referring to Niknafs and Ali-Ibn Abi Talib Hospitals affiliated with Rafsanjan University of Medical Sciences, Rafsanjan, in 2016.

Material and Methods

This cross-sectional study was conducted in 2016. The study population consisted of all pregnant women who referred to maternity ward of Niknafs and Ali-Ebn Abitaleb Hospitals in Rafsanjan. The participants were 839 women who were selected through census method during June-November 2016. The objectives of the study were explained to the women and informed consent was obtained from them before entering them into the study. The exclusion criteria consisted of multiple pregnancy and overt diabetes, chronic hypertension, and other overt diseases before the pregnancy. In the emergency ward, data were recorded in a checklist using the mother's health records, and in cases lacking a health record, the family members were asked to provide the mother's health record. The checklist contained items on age, birth order, and pregestational women height, weight, and body mass index (BMI).

The mother's pregestational height and weight had been measured in health centers. BMI was calculated using the formula: body weight (Kg) divided by the square of height (m^2). BMI of less than 18.5, 18.5-24.9, 25-29.9, 30-34.9, 35-39.9, and 40 Kg/m^2 or higher illustrates underweight, normal weight,

overweight, obesity, obesity type 2, and morbid obesity, respectively (4).

In the emergency unit, the mother's weight was measured once using a Seca 881 digital floor scale (Germany). Moreover, total weight gain during pregnancy was calculated through the subtraction of pregestational weight from the final pregnancy weight. Data related to the type of delivery (vaginal or C-section), the birth weight, height, head circumference, and the infant's gender were recorded in the checklist. The infant's weight was measured using an EBSL-20 Electronic Baby Scale and their birth height was measured using an infant height gauge present at the maternity ward. The collected data were analyzed in SPSS software (version 21, IBM Corporation, Armonk, NY, USA). To assess the association between quantitative variables, independent two-sample t-test or one-way ANOVA were used, and to evaluate the association between qualitative variables, chi-square test or Fisher's exact test were used. All P values lower than 0.05 were considered significant.

Results

In the present study, 839 women with a mean age of 28.09 ± 5.19 were studied. The mean and standard deviation, maximum, and minimum of the measure variables are presented in table 1.

Table 1: Descriptive indicators of the studied variables in women referring to Niknafs and Ali-Ebn Abitaleb Hospitals of Rafsanjan, Iran, in 2016 (n = 839)

Variable	Minimum	Maximum	Mean ± SD
Age (year)	16	43	28.09±5.19
Gestational age (week)	25	42	39.15±1.38
Birth order	1	7	1386±1.01
Height (cm)	135	178	160.94±5.55
Weight (Kg)	35	116	62.80±11.77
Body mass index (BMI) (Kg/m^2)	14.84	45.31	24.20±4.31
Maternal weight at delivery (Kg)	49.5	123	75.26±12.03
Total weight gain (kg)	1	32	12.46±4.80
Birth weight (g)	620	4675	3179.33±440.91
Birth Height (cm)	29	55	48.52±2021
Birth Head circumference (cm)	22	39.5	34.11±1.43

Based on pregestational BMI, the prevalence of overweight and obesity was 37.5%, from among which 1.9% had obesity type 2 and morbid obesity. Moreover, the prevalence of low weight was 7.4% in the present study.

The prevalence of malnutrition and 95% confidence interval (CI) among the studied subjects based on BMI classifications is presented in table 2.

Table 2: The prevalence of malnutrition in pregnant women referring to Niknafs and Ali-Ebn Abitaleb Hospitals of Rafsanjan, Iran, based on body mass index before pregnancy in 2016

BMI	Number (%)	95% CI
Underweight	62 (7.4)	5.6-9.2
Normal	462 (55.1)	51.7-58.5
Overweight	226 (26.9)	23.9-29.9
Obese	89 (10.6)	8.5-12.7
Total	839 (100)	-

Table 3 illustrates descriptive indicators in the studied subjects based on classifications of pregestational BMI and anthropometric measurements of their infants. The results presented in table 3 show that the difference in the 4 measured variables (total weight gained,

and weight, height, and head circumference at birth) between women with different BMI was statistically significant. However, no significant difference existed among different groups in terms of gestational age (P = 0.656).

Table 3: Comparison of the descriptive indicators of the studied variables in pregnant women referring to Niknafs and Ali-Ebn Abitaleb Hospitals of Rafsanjan, Iran, based on classifications of their BMI before pregnancy and anthropometric measurements of their infants in 2016

BMI	Gestational age (week)	Gestational weight gain (Kg)	Birth weight (gr)	Birth height (cm)	Birth Head circumference (cm)
Underweight (n=62)	39.21±1.07	13.21±3.8	2978.95±373.91	47.95±1.52	33.44±1.08
Normal (n =462 individuals)	39.15±1.39	13.22±4.83	3162.82±436.68	48.48±2.36	34.07±1.48
Overweight (n =226)	39.18±1.45	11.51±4.67	3228.69±459.22	48.61±2.16	34.31±1.39
Obese (n =89)	38.98±1.35	10.38±4.66	3279.33±412.47	48.94±1.81	34.31±1.29
Total (n =839	39.15±1.38	12.48±80.4	3179.33±440.91	48.53±2.21	34.11±1.43
P	0.656	<0.001*	<0.001*	0.048*	<0.001*

One-way ANOVA *P < 0.05 was significant

Table 4 presents the frequency distribution of pregnant women based on classification of BMI before pregnancy and birth weight of infants. As can be seen in this table, a significant difference was observed among underweight and overweight women in birth weight of their infants (P = 0.039).

Table 4: Frequency distribution of pregnant women referring to Niknafs and Ali-Ebn Abitaleb Hospitals of Rafsanjan, Iran, based on classification of their body mass index before pregnancy and their infants' weight at birth in 2016

Classification of BMI before pregnancy	Classification of Birth weight				P-value
	Low birth weight Number (%)	Normal Number (%)	Macrosomia Number (%)	Total Number (%)	
Underweight	6 (9.7)	56 (90.3)	0	62 (100)	0.029*
Normal	27 (5.8)	422 (91.3)	1	462 (100)	
Overweight	7 (3.1)	205 (90.9)	14 (6.2)	226(100)	
Obese	3 (3.4)	81 (91)	5 (5.6)	89 (100)	
Total	43 (5.1)	764 (91.1)	32 (3.8)	839(100)	

Fisher's exact test *P < 0.05 was significant

Discussion

In the present study, based on BMI before pregnancy, 7.4%, 37.5%, and 1.9% of women were underweight, overweight and obese, and obese type 2 and morbidly obese.

In this study, both dimensions of malnutrition (under nutrition and over nutrition) were observed; however, a higher prevalence of overweight and obesity was observed compared to underweight. These results show the importance of nutrition even during pregnancy which is in agreement with the results of previous studies. In countries with a low or moderate economic status, not only has malnutrition of mothers and infants in the form of underweight not been eradicated, but also the prevalence of malnutrition in the form of overweight and obesity has increased (16). This is also the case among women in the

southeast of Iran. In the present study, less than half of the women were obese before their pregnancy. In the study by Jenabi et al. in Hamedan, Iran, 2.16% of the subjects were overweight and 8.8% were obese (21). In the study by Keshavarz et al. in Shahrud, Iran, the prevalence of obesity was 13.6% (22). In addition, in the study by Bahrami et al. in Mashhad in 2014, the prevalence of overweight and obesity among pregnant women were, respectively, 20.1% and 7.3% (23). These rates were higher in the present study. The higher prevalence of obesity in the current study is not unanticipated; previous studies also reported different prevalence of overweight and obesity for different parts of Iran (4). Factors such as economic status, social status, nutrition intake, activity type, especially in women, and other environmental factors (5) may be the causes of this difference in the prevalence of obesity in different parts of Iran. The high prevalence of obesity in the southeast of Iran is a warning for health and treatment authorities and health care providers of Rafsanjan, because obesity and its complications during pregnancy place the future generations at a greater risk of chronic diseases (15).

The comparison of the results of the present study with that of previous studies showed that the prevalence of underweight in the present study differed from that in previous studies. Jenabi et al. (21) and Bahrami et al. (23) reported a prevalence of 13.9% and 5.6% of underweight women, respectively. Nevertheless, in the present study, 7.4% of women were underweight. Although this rate differs from that reported in the two abovementioned studies, the present study showed that the rate of underweight was lower than overweight and governments are concerned with increasing prevalence of obesity.

The comparison of the mean of anthropometric measurements in infants of mothers with different BMI showed that underweight mothers had LBW newborn more than than other groups. The results of the present study were in accordance with that of the studies by Soleimanizadeh (24) and Bahrami et al. (23). It seems that BMI before pregnancy can affect the most important outcome of pregnancy, which is the weight of the infant at birth is significantly affected by the mother's BMI before pregnancy (12, 25).

In the present study, the prevalence of LBW was 5.12%. 9.7% of underweight women had LBW newborn and the difference in this rate with other groups was significant. This finding was in agreement with that of previous studies. In other words, the risk of LBW is higher in underweight mothers (25). LBW (lower than 2500 g) is considered as one of the main causes of stillbirth and mortality during infancy (25), and it is an important health concern around the world and its short-term and long-term effects have been reported (26). The prevalence of non-alcoholic fatty liver disease (NAFLD) during childhood was higher among infants born with LBW or high birth weight (HBW), and the rate of steatosis was higher in HBW compared to LBW (27). Weight at birth in both groups of infants (LBW and HBW) seems to place them at risk of chronic diseases (27). LBW is related to mortality during infancy and diseases during adulthood, especially chronic diseases (28).

In a study conducted in 2005 in Rafsanjan and the same hospitals studied in the present study, low weight was reported in 13.15% on infants (29). The comparison of the results of the current study and this study shows an 8% reduction in LBW in one decade. In the study by Momeni et al., the prevalence of birth of infants with LBW was 9.4% (30). Mahmoudi et al., in a review study, reported that the prevalence of infants with LBW was 5-12% in more than 70% of studies, and its prevalence was 13-19.1% in 5 studies (31).

Based on the World Health Organization (WHO) reports, 15-20 percent of all infants born around the world (more than 20 million births annually) have LBW, and in Southern Asia, 28% of infants are born with LBW (26).

One of the important nutrition-related goals until 2025 is a 30% reduction in birth of

infants with LBW which can be achieved through an annual 3% reduction during 2012-2025 (23). The comparison of the present study findings with the study by Dehghani, which was conducted a decade ago in Rafsanjan, shows an 8% reduction in LBW (29); however, there is a long way until the achievement of the goals for 2025.

Moreover, the prevalence of infants with macrosomia was 3.8%; 11.8% of overweight and obese women gave birth to infants with HBW, but none of the underweight women gave birth to infants with macrosomia. The prevalence of macrosomia in the present study was in accordance with that reposted in the studies by Ghanbari et al. (32) and Mardani et al. (33). The possibility of mortality is high in infants with macrosomia and its most important complications include clavicle fracture, brachial plexus injury, and hypoglycemia (26).

The present study results illustrated that appropriate and normal nutrition status before pregnancy impacted the outcome of pregnancy (infants' weight at birth). This finding was in agreement with that of other studies (20). It is noteworthy that the two groups of infants with low weight and macrosomia experience similar complications in later life stages (27, 28). Thus, the weight and BMI of mothers must be evaluated before pregnancy, and the required interventions, such as suitable diet and increased activity (lifestyle changes), should be implemented and plans be made for a pregnancy after they reach a normal weight.

The limitation of this study was that, due to the high rate of birth in Rafsanjan and the overcrowded emergency ward, the completion of the checklist was not easy and required a long duration of time.

Conclusion

In the present study, the total prevalence of malnutrition was 237.5% in the dimension of overweight and obesity and 7.4% in the dimension of underweight. Mean anthropometric measurements of infants of these two groups of women differed significantly. The highest number of infants with low birth weight and macrosomia were, respectively, related to low weight and obese mothers. The high prevalence of obesity in Rafsanjan is a warning for health and treatment authorities and health care providers. Although the birth of infants with low weight and macrosomia has been controlled through prenatal care, there is a long way until the achievement of the goals for 2025.

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