Association of Weight Gain with Neonates' Anthropometric Features Between Iranian and Afghan Pregnant Women Based on MOH

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Abstract

Background: The present study aimed to determine and compare the weight gain patterns of Iranian and Afghan pregnant women and investigate their relationship with neonatal anthropometric features.

Methods: In this descriptive-analytical study, the health profiles of randomly selected Iranian and Afghan pregnant women referred to health centers in Semnan city, Iran, were reviewed. Data were collected following the guidelines recommended by the Institute of Medicine (IOM). Neonatal anthropometric measures were evaluated based on the reference values issued by the Iranian Ministry of Health (MOH). A statistical significance level of P < 0.05 was considered.

Results: The average age of Afghan mothers was 27.36 ± 5.46 years, while that of Iranian mothers was 29.13 ± 5.44 years. The average weight gain during pregnancy was slightly lower in Afghan mothers (OR = -0.88, 95% CI: 0.82 - 0.94). Although the average weight gain in both groups and the percentiles of neonatal anthropometric measures were within permissible limits, a regression model indicated that weight gain during pregnancy significantly affected neonatal birth weight only in Iranian mothers (β = -0.313, P ≤ 0.001). Logistic regression analysis revealed no significant difference in the impact of maternal weight gain on neonatal anthropometric measures between the Iranian and Afghan mothers.

Conclusions: The findings of this study suggest that nationality (i.e., Iranian or Afghan) does not influence maternal weight gain or neonatal anthropometric measures. The establishment of guest houses and training programs, such as Behbakhsh initiatives for Afghan women, appears to have been effective in ensuring equitable access to health services for Afghan immigrants.

Keywords: Pregnancy Weight Gain, Anthropometric Measures, Pregnancy, Immigrant, Afghan, Iran, Refugee, Neonatal Parameters

1. Background

Immigrants and refugees are among the most vulnerable populations in host countries. Feelings of discrimination and isolation in the host country can jeopardize their physical and psychological health. Women, who constitute approximately 47% of all immigrants and refugees, are often in their reproductive years, heightening their vulnerability to physical and psychological harm (1).

Studies have shown that female refugees face higher maternal health risks compared to native women in host countries, making the health of refugee mothers a growing concern for healthcare professionals and stakeholders at both national and international levels (2).

In a review of 35 studies on the health needs of immigrant mothers, Almeida et al. reported that most studies acknowledged these women face higher health risks, including inadequate access to obstetric interventions, a higher incidence of stillbirth and premature neonatal mortality, an increased risk of maternal mortality, and a higher prevalence of postpartum depression. However, the rates of these

events vary substantially among different population groups (3).

Despite having the official right to access maternity healthcare, female refugees often encounter barriers to receiving healthcare services in most host countries. Multiple reviews and original studies have explored the root causes of this issue. They report several reasons for the lower utilization of healthcare services by immigrant women, including inaccessibility to health facilities (especially for undocumented immigrants), poor communication between female immigrants and caregivers (due to language barriers, cultural differences, etc.), transportation challenges, financial constraints, and fear of discrimination (4, 5).

Afghans constitute approximately 96% of registered refugees in Iran, accounting for 3% of Iran's total population. These immigrants include individuals with valid certifications to enter the country, as well as those who have crossed Iran's eastern borders illegally. Nearly half of these immigrants are women, most of whom are in their reproductive years. Studies indicate that some Afghan women experience domestic violence from their spouses and face poor literacy and economic conditions. Additionally, many are not permitted to appear in public without the approval of their male family members, which can significantly jeopardize their health. Since 2016, all eligible registered Afghans in Iran have been able to apply for public health insurance, granting them access to medical services similar to those available to Iranian citizens (6, 7).

Limited studies have been conducted on the maternal and neonatal health indicators of Afghan women in Iran. The Body Mass Index (BMI), both at the beginning and during pregnancy, can significantly influence pregnancy outcomes. A low BMI in mothers has been linked to intrauterine growth restriction, fetuses disproportionately small for gestational age, premature labor, and low birth weight. Conversely, a high BMI has been associated with complications such as hypertension, gestational diabetes, postpartum hemorrhage, fetal macrosomia, and an increased likelihood of cesarean section (8, 9).

Despite the fact that all pregnant women in Iran have access to comprehensive prenatal care, recent notions suggest higher rates of mortality and perinatal complications among Afghan pregnant women and their babies compared to their Iranian counterparts. Studies have highlighted differences in weight gain

patterns between Iranian and Afghan pregnant mothers, as well as disparities in the anthropometric measures of their neonates. In a 2013 study conducted in Qazvin province, Asefzadeh et al. reported that Iranian mothers and newborns outperformed their Afghan counterparts in all investigated anthropometric indices (10).

Similarly, Rezaeian et al., in a 2013 study in Rafsanjan, found that Afghan women gave birth to premature and low-birth-weight babies more frequently than Iranian women. They attributed this phenomenon to factors such as ethnicity, lack of proper insurance coverage, limited access to healthcare services, and the poor economic and social conditions of Afghan immigrants (11).

As of 2023, the number of legal Afghan immigrants in Iran exceeded 5 million, with 24,971 residing in Semnan city, of whom 12,162 are women. Semnan province is one of the regions hosting a significant number of foreign refugees. To provide services to vulnerable and low-income individuals, the Department of Immigrants' Affairs has established guest cities (Mehmanshahr) in several immigrant-friendly provinces, including Semnan. These guest cities include "Health Centers" dedicated to serving immigrants. The comprehensive health center in Semnan's guest city employs 11 staff members, including doctors, midwives, and Behbakhsh (community health workers).

Behbakhsh (CHWs) are recruited from eligible immigrants and begin delivering health services in these centers after a few months of necessary training. In contrast, Behvarzse (CHWs) are native Iranians who undergo a two-year training course and are officially employed by the Iranian Ministry of Health (MOH). Behbakhsh are associated with the specific department for immigrant affairs, undergo shorter training periods, and work under contracts with the Commissariat of Nationals.

2. Objectives

Currently, more than 4,540 Afghan immigrants reside in Semnan's guest city, of whom 2,274 are women. Given the lack of updated information regarding the role of nationality in weight gain patterns among Iranian and Afghan pregnant women and the expansion and improvement of health services for Afghan women, this study aims to evaluate the weight gain patterns of Iranian and Afghan pregnant women under the

coverage of health centers in Semnan city and their relationship with the anthropometric measures of newborns.

3. Methods

3.1. Study Setting and Sampling

In a cross-sectional study with a quantitative approach, we analyzed Iranian and Afghan women who gave birth and received maternity care services from March 2021 to March 2022 at health provider units affiliated with the Semnan Health Center. The inclusion criteria were as follows: Age between 18 and 40 years, singleton pregnancy, a complete health profile, and term delivery. Mothers with hypertension, diabetes, eclampsia, pre-eclampsia, cardiovascular, hematologic, renal, hepatic, thyroid disorders, anemia, or epilepsy (before or during pregnancy) were excluded. Additional exclusion criteria included smoking, alcohol consumption, drug addiction, and residing in high-altitude areas.

A preliminary estimation indicated that 1,953 Iranian women and 500 Afghan women gave birth in Semnan city in 2021. Using α = 0.05, a standard error (standard deviation) of P = Q = 0.5, and a test error (d) of 0.09 for Afghan women and 0.05 for Iranian women, the required sample size for the study was calculated as N = 420 participants. Ultimately, 320 Iranian and 100 Afghan mothers were enrolled using stratified sampling. A list of eligible pregnant women (based on the inclusion criteria) was prepared by reviewing the Sib database. Participants were selected systematically and randomly, maintaining a balanced representation by nationality.

3.2. Data Collection Tools

The data were collected using a checklist completed by two experienced experts involved in maternity health provision programs. For data collection, the two health experts visited 16 healthcare units across Semnan city. With the cooperation of the staff at these units, the required data were extracted from the Sib database. Afghan immigrants have resided in Semnan city for several years and are distributed across various districts. Since these immigrants have been utilizing health services provided by the city's healthcare centers, the necessary data for this study were documented and accessible through the Sib system. The checklist used for data collection included demographic information, maternity care details, and newborn characteristics. The demographic section recorded details such as the mother's age, nationality, education, occupation, and residential status. The maternity care section documented the number of pregnancies, number of deliveries, history of abortion or stillbirth, time elapsed since the prior delivery, type of delivery, pre-pregnancy BMI, and the trend of weight gain during three stages of pregnancy: Early (6 - 10 weeks), middle (16 - 20 weeks), and late (38 - 42 weeks). The newborn section included information on gender, weight, height, and head circumference at birth. Weight gain was calculated based on the guidelines provided by the Institute of Medicine (IOM) for singleton pregnancies in women aged 18 years [12] and older. The recommended weight gain ranges for various pre-pregnancy BMI categories were as follows: Body Mass Index < 18.5: 12.5 - 18 kg; BMI 18.5 - 24.9: 11.5 - 16 kg; BMI 25 - 29.9: 7 - 11.5 kg; BMI ≥ 30: 5 - 9 kg (Table 1).

Based on the latest guidelines issued by Iran's MOH, Treatment, and Medical Education, a newborn's growth parameters—including height, weight, and head circumference—are measured immediately in the delivery room. For full-term babies born after the 40th week of pregnancy, the expected ranges are: Height: 48 - 53 cm; weight: 2500 - 4000 gr; and head circumference: 33 - 37 cm. The anthropometric measures of mothers and newborns were documented and subsequently compared between Iranian and Afghan participants.

3.3. Data Analysis

Data analysis was conducted using SPSS software, with a statistical significance level set at $P < 0.05$ for all tests. The analysis was carried out at both descriptive and inferential levels. For the descriptive analysis, frequency, mean, and standard deviation were calculated. At the inferential level, the normality of the data distribution was initially assessed using the Kolmogorov-Smirnov test. Variables with a normal distribution were analyzed using the chi-square test, analysis of variance, Pearson correlation, independent *t*-test, and logistic linear regression. The chi-square test and Fisher's exact test were applied to compare the frequency distributions of categorical data.

3.4. Ethical Consideration

Table 1. Demographic Features of Studied Mothers by Nationality [a]

Variables	Nationality		Total	P-Value
	Iranian	Afghan		
Place of residence				> 0.001
Urban	330 (100)	0 (0)	330 (76)	
Rural	66 (63.5)	38 (36.5)	104 (24)	
Education				> 0.001
Secondary school and lower	52 (15.8)	50 (48.1)	102 (23.5)	
Diploma	143 (43.3)	11 (10.5)	154 (35.5)	
University education	133 (40.3)	1 (1)	134 (30.9)	
Illiterate	2 (0.6)	42 (40.4)	44 (10.1)	
Employment status				0.001
Employed	31 (9.4)	299 (90.6)	330 (76)	
Housewife	0 (0)	104 (100)	104 (24)	
Health insurance status				> 0.001
Yes	330 (100)	0 (0)	330 (76)	
No	7 (6.7)	97 (92.3)	104 (24)	

[a] Values are expressed as No. (%).

This study protocol was approved by the Ethics Committee of Shahid Beheshti University of Medical Sciences (IRAN) under the ethical code IR.SBMU.SME.REC.1401.072. Data were collected by assigning specific codes to each participant. The research participants were assured of the confidentiality of their information.

4. Results

This study aimed to determine and compare the weight gain patterns of Iranian and Afghan pregnant women, as well as the anthropometric measures of their newborns. A total of 434 pregnant women participated in the study, including 104 Afghan and 330 Iranian women.

4.1. Maternal Parameters

The mean maternal age was 29.13 ± 5.44 years (range 15 - 40 years) for Iranian mothers and 27.36 ± 6.46 years (range 17 - 40 years) for Afghan mothers. Of the 434 pregnant women studied, 38 resided in rural areas, while the remainder lived in urban regions. Among Iranian mothers, 31 were employed, with the rest being housewives, whereas none of the Afghan mothers were employed. A significantly higher proportion of Afghan mothers were illiterate compared to their Iranian counterparts (P < 0.001). Additionally, all Iranian mothers were covered by health insurance, whereas only 6.7% of Afghan mothers had such coverage (Table 1).

Maternal factors, including abortion history, type of delivery, and the frequency of previous pregnancies and deliveries, are presented in Table 2. Abortions and cesarean deliveries were significantly more common among Iranian mothers compared to Afghan mothers. However, there was no statistically significant difference in the distribution of pre-pregnancy weight categories between Iranian and Afghan mothers (Table 2).

The comparison of mean weight gain revealed that Iranian and Afghan mothers were comparable across all four BMI categories based on the reference ranges established by Iran's MOH. However, Afghan mothers exhibited lower weight gain compared to Iranian mothers, with a significant difference observed between normal-weight and obese mothers, but not between underweight and normal-weight women (based on BMI) (Table 3).

4.2. Neonatal Parameters

The frequency distribution of height, weight, and head circumference percentiles of neonates by gender and nationality is presented in Table 4. The results indicate that 1.8% of Afghan neonates had a head circumference and height below the third percentile, while 36.7% had a weight above the 97th percentile.

Table 2. The Frequency Distribution of Maternal Indicators by Nationality [a]

Maternal Factors	Nationality		Total	P-Value
	Iranian	Afghan		
History of abortion				0.709
Yes	36 (10.9)	10 (9.6)	46 (10.6)	
No	294 (89.1)	94 (90.4)	388 (89.4)	
Type of delivery				0.001 >
Normal delivery	186 (56.4)	84 (80.8)	270 (62.2)	
Cesarean section	144 (43.6)	20 (19.2)	164 (37.8)	
Number of pregnancies				0.001 >
1	140 (42.4)	24 (23.1)	164 (37.8)	
2	125 (37.9)	26 (25)	151 (34.8)	
3	46 (13.9)	26 (25)	72 (16.6)	
4 and more	19 (5.8)	28 (26.9)	47 (10.8)	
Number of deliveries				0.001 >
1	153 (46.4)	24 (23.1)	177 (40.8)	
2	128 (38.8)	30 (28.8)	158 (36.4)	
3	37 (11.2)	25 (24)	62 (14.3)	
4 and more	12 (3.6)	25 (24)	37 (8.5)	
BMI				0.216
Less than 18.5	21 (6.4)	5 (4.8)	26 (6)	
24.9 - 18.5	163 (49.4)	52 (50)	215 (49.5)	
29.9 - 25	112 (33.9)	29 (27.9)	141 (32.5)	
30 and more	34 (10.3)	18 (17.3)	52 (12)	

Abbreviation: BMI, Body Mass Index.

[a] Values are expressed as No. (%).

Table 3. Comparison of Mean Weight Gain Between Iranian and Afghan Mothers at the End of Pregnancy [a]

BMI	Reference Range(kg)	Weight Gain (kg)		P-Value
		Iranian Mothers	Afghan Mothers	
Less than 18.5	12.5 - 18	14.75 ± 3.27	14.2 ± 2.88	0.816
18.5 - 24.9	11.5 - 16	12.99 ± 3.74	11.42 ± 3.23	0.004
25 - 29.9	7 - 11.5	10.41 ± 3.1	9.29 ± 3.68	0.098
30 and more	9 - may	9.09 ± 4.51	6.58 ± 2.17	0.009

Abbreviation: BMI, Body Mass Index.

[a] Values are expressed as mean ± SD.

A significant difference was observed in the frequency distribution of height percentiles between male and female Iranian neonates (P = 0.011), but not among neonates born to Afghan mothers. Additionally, height percentiles were comparable between male and female Iranian and Afghan neonates (X^2 = 5.158, P = 0.378 for female Iranian and Afghan neonates; X^2 = 7.134, P = 0.282 for male Iranian and Afghan neonates).

No significant difference was observed in the frequency distribution of weight percentiles between male and female neonates, either among those born to Iranian mothers (P = 0.209) or Afghan mothers (P = 0.169). Similarly, comparisons between female (X^2 = 6.608, P = 0.343) and male (X^2 = 5.393, P = 0.367) Iranian and Afghan neonates revealed no significant differences. Overall, there was no significant difference in the weight percentiles of neonates born to Iranian and Afghan mothers (P = 0.254).

The frequency distribution of head circumference percentiles showed a significant difference between

Table 4. Frequency Distribution of Height, Weight, and Head Circumference Percentiles in Newborns by Gender and Nationality [a]

Variables and Percentiles	Gender and Nationality of Babies				X²	P-Values
	Iranian Girl	Afghan Girl	Iranian Boy	Afghan Boy		
Length of the baby					9.264	0.136
3rd percentile, and less	0 (0)	0 (0)	0 (0)	1 (1.8)		
More than 3 and less than 50	6 (4.3)	5 (10.2)	17 (9)	6 (10.9)		
50th percentile	37 (26.2)	8 (16.3)	78 (41.3)	18 (32.7)		
More than 50 and less than 97	92 (65.2)	34 (69.4)	85 (45)	25 (45.5)		
97th percentile and more	6 (4.3)	2 (4.1)	9 (4.8)	5 (9.1)		
Baby's weight					7.472	0.254
3rd percentile, and less	0 (0)	0 (0)	0 (0)	1 (1.8)		
More than 3 and less than 50	41 (29.1)	1 (2)	58 (30.7)	21 (38.2)		
50th percentile	51 (36.2)	8 (16.3)	49 (25.9)	15 (27.3)		
More than 50 and less than 97	48 (34)	22 (44.9)	82 (43.4)	18 (32.7)		
97th percentile and more	1 (0.7)	18 (36.7)	0 (0)	0 (0)		
Head circumference					7.777	0.155
3rd percentile, and less	10 (7.1)	3 (6.1)	19 (10.1)	1 (7.3)		
More than 3 and less than 50	55 (39)	20 (40.8)	45 (23.8)	16 (29.1)		
50th percentile	67 (47.5)	24 (49)	122 (64.6)	33 (60)		
More than 50 and less than 97	9 (6.4)	2 (4.1)	3 (1.6)	2 (3.6)		
97th percentile and more	0 (0)	0 (0)	0 (0)	0 (0)		

[a] Values are expressed as No. (%) unless otherwise indicated.

Table 5. Regression Analysis Models for Investigating the Impact of Nationality (Iranian vs. Afghan) and Weight Gaining During Pregnancy of Mothers on Newborns' Anthropometric Parameters

Variables Included in the Model	Coefficients			t	P-Value	95% CI for B	
	Unstandardized		Standardized			LowerLimit	Upper Limit
	B	SE					
The Weighing Iranian Mothers (Dependent Variable) and Newborn Indices (Linear Regression)							
Constant	-6.134	6.519	-	-0.941	0.347	-18.948	10.61
Baby's weight	0.003	0.001	0.257	3.659	< 0.001	0.001	0.004
Length of the baby	0.166	0.127	0.082	1.308	0.192	-0.084	0.415
Head circumference	-0.007	0.192	-0.002	-0.038	0.97	-0.385	0.37
The Weighing Afghan Mothers (Dependent Variable) and Newborn Indices (Linear Regression)							
Constant	-13.789	11.33	-	-1.217	0.226	-36.267	8.689
Baby's weight	0.002	0.001	0.232	1.875	0.064	0	0.003
Length of the baby	-0.065	0.184	-0.039	-0.351	0.726	-0.43	0.301
Head circumference	0.631	0.336	0.221	1.724	0.088	-0.095	1.357
The Effect of Nationality: Comparison of Afghan and Iranian Mothers (Logistic Regression)							
Variables	B	SE	Wald	P-Value	Exp (B)	Lower Limit	Upper Limit
Constant	-1.94	4.102	0.224	1	0.636		
Maternal weight gain	-0.125	0.033	14.182	1	< 0.001	0.883	0.828
Baby's weight	0	0	0.049	1	0.825	1	0.999
Length of the baby	0.063	0.067	0.889	1	0.346	1.065	0.934
Head circumference	-0.037	0.109	0.117	1	0.722	0.963	0.778

male and female Iranian neonates (P = 0.003), while no significant difference was observed between male and female Afghan neonates (P = 0.834). Additionally, comparisons of head circumference percentiles

between male Iranian and Afghan neonates (X² = 5.307, P = 0.343) and female Iranian and Afghan neonates (X² = 3.884, P = 0.558) revealed no significant differences (Table 4).

4.3. The Effect of Maternal Weight Gaining Pattern on Neonates' Anthropometric Measures

A linear regression analysis was performed to examine the effect of maternal weight gain during pregnancy among Iranian and Afghan mothers on their newborns' anthropometric parameters, with weight gain designated as the dependent variable. The standardized beta coefficient was calculated as 0.313, indicating that each unit increase in maternal weight gain during pregnancy among Iranian mothers could lead to a 0.313 unit increase in the birth weight of the newborn. Other neonatal anthropometric measures of Iranian newborns were not significantly associated with maternal weight gain during pregnancy. Furthermore, none of the neonatal anthropometric parameters were significantly correlated with maternal weight gain during pregnancy among Afghan mothers (Table 5).

As demonstrated by a logistic regression model, there was a significant difference in weight gain during pregnancy between Iranian and Afghan mothers. However, no significant differences were found in other variables. While Iranian mothers gained more weight during pregnancy compared to their Afghan counterparts, this difference did not have a significant impact on their newborns' anthropometric parameters at birth, including height, weight, and head circumference (Table 5).

5. Discussion

Immigrants, particularly women of reproductive age, encounter challenges that extend beyond the issues of displacement, leading to adverse health outcomes. Several reviews have focused on the health conditions and challenges faced by female refugees regarding access to maternal care (3-5, 13). In this study, we examined the weight gain patterns of pregnant Iranian and Afghan mothers and analyzed their association with neonatal anthropometric indices.

Pre-pregnancy weight and weight gain during pregnancy have long been recognized as critical factors for favorable labor outcomes. Recent studies have reinforced the notion that maternal weight gain during pregnancy can significantly influence neonatal

anthropometric parameters (14-16). In the present study, 4.8% of Afghan mothers were underweight before pregnancy, compared to 6.4% of Iranian mothers. Additionally, 50% and 28% of Afghan mothers fell into the normal weight and overweight categories, respectively. Furthermore, 17.3% of Afghan mothers had pre-pregnancy obesity, compared to 10% of Iranian mothers.

In the present study, the average weight gain during pregnancy was within the permissible range for both Iranian and Afghan mothers, as defined by the reference range issued by Iran's MOH. While Afghan mothers exhibited slightly lower average weight gain compared to their Iranian counterparts, this difference was statistically significant only in the normal weight and obese BMI categories. Pre-pregnancy obesity was observed to be more prevalent among Afghan mothers, which may partly account for the higher weight gain among Iranian mothers during pregnancy. However, additional determinants such as socioeconomic status, nutritional habits, health literacy, and the quality of prenatal care should be further investigated to fully understand these differences.

Evidence suggests a direct association between maternal weight before pregnancy, weight at delivery, and neonatal birth weight. Furthermore, pre-pregnancy BMI has been shown to significantly influence pregnancy outcomes (14-16). In Bahrami et al.'s study, 5.6%, 44.5%, 20.1%, and 7.3% of mothers were categorized as underweight, normal weight, overweight, and obese, respectively, with a mean BMI of 23.9 ± 4.2 kg/m² (17). The researchers reported a significant correlation between maternal BMI at the beginning of pregnancy and neonatal birth weight. The BMI distribution among mothers in our study closely resembled that observed in Bahrami et al.'s research (17).

Similarly, Nemmati et al. highlighted the significant role of maternal pre-pregnancy BMI, emphasizing that maternal BMI and weight prior to pregnancy are critical anthropometric factors strongly associated with neonatal birth weight. This underscores the importance of providing appropriate training and counseling for mothers before and during pregnancy to manage their BMIs effectively, thereby optimizing neonatal birth weight outcomes (18).

In their study, Kahnamouei Aghdam et al. reported a positive correlation between maternal pre-pregnancy BMI and neonatal birth weight, reinforcing the

importance of maternal BMI as a predictor of neonatal outcomes (19). Similarly, Najafi et al. highlighted a link between maternal pre-pregnancy BMI and neonatal anthropometric measures, suggesting the need for thorough maternal BMI assessments during pregnancy alongside tailored training and nutritional counseling to optimize outcomes (20).

In the present study, 1.8% of Afghan neonates were born with height and weight below the third percentile, and 36.7% of them (compared to 0.7% of Iranian neonates) had a weight above the 97th percentile. Despite these observations, neonatal anthropometric parameters overall did not reveal significant differences between newborns of Afghan and Iranian mothers. Furthermore, logistic regression analysis examining the impact of maternal weight gain on neonatal anthropometric measures found no statistically significant differences between the two groups.

Contrary to our findings, Asefzadeh et al. identified significant differences in neonatal weight, height, and head circumference, all of which were higher among Iranian neonates (10). Similarly, Rezaeian et al. reported heavier birth weights for Iranian neonates compared to their Afghan peers (11). The discrepancies between these studies and the present findings may stem from differences in study periods or population characteristics. Additionally, the neonatal and childhood growth of refugee descendants is often influenced by socioeconomic factors, with poor socioeconomic conditions in immigrant households playing a critical role.

In the current study, we observed a significant correlation between maternal weight gain during pregnancy and neonatal weight, height, and head circumference at birth among both Iranian and Afghan mothers. This aligns with previous research emphasizing the relationship between maternal weight gain patterns and neonatal anthropometric outcomes. These findings highlight the importance of monitoring and supporting appropriate maternal weight gain during pregnancy to ensure optimal neonatal health outcomes.

Neonatal anthropometric measures are critical predictors of neonatal mortality and morbidity. Considering the association between maternal weight-gaining patterns during pregnancy and neonatal health indicators, it is essential to implement policies and integrated plans that encourage women to give birth at

an appropriate age while addressing and improving their weight and nutritional status before pregnancy. For women experiencing unplanned or unwanted pregnancies, tailored weight-gaining recommendations should be provided, such as maximizing weight gain for underweight mothers or minimizing it for obese mothers.

In this study, approximately half of the Afghan women were illiterate, and only 7% had health insurance. Although Afghan refugees in Iran reportedly have acceptable access to healthcare services, there remains a need to enhance these services. Moreover, official data and evidence on healthcare access for Afghan immigrants across Iran remain limited.

In a qualitative study conducted by Dadras et al. on Afghan women living in southern Tehran province, financial constraints, lack of affordable health insurance, misbehavior by healthcare personnel, transportation issues, stigma, discrimination, cultural differences, and immigration-related legal challenges were identified as the root causes of despair and inadequate healthcare utilization (6). The study also revealed that more than half (56.6%) of Afghan women experienced at least one pregnancy complication. Women who were illiterate, unemployed, lacked legal documentation, had poor socioeconomic status and mental health, lacked health insurance, faced food insecurity during pregnancy, or were exposed to domestic violence were more likely to experience adverse pregnancy outcomes (7).

Similarly, Das Gupta et al. reported that maternal and neonatal complications among Afghan mothers were linked to factors such as illiteracy, short intervals between pregnancies, exposure to domestic violence, poor economic conditions, and lack of health insurance (21). Almeida et al. further highlighted that refugees generally face lower access to healthcare services, especially among undocumented immigrants. Challenges such as communication barriers with caregivers, limited access to health facilities, and higher rates of adverse maternal and neonatal outcomes were identified as key issues for refugees compared to the native population of host countries (3).

In a review, da Conceição et al. highlighted the experiences of refugee women, emphasizing their struggles with depression, poor socioeconomic conditions, and limited use of health services due to language barriers and difficulties in establishing

effective communication with healthcare professionals ([13](#)). Similarly, Pangas et al., in an ethnographic review, explored the experiences of refugee women navigating between two cultures, noting their efforts to maintain their original cultural identity while adapting to the host country's cultural context ([4](#)). In another study, Khan and DeYoung examined immigrants' perspectives and underscored the need for physical resources, effective leadership, and additional workforce with specific language capabilities. Language and cultural barriers consistently emerge as major obstacles to healthcare access for refugees worldwide ([5](#)). However, the shared language between Iranians and Afghans can facilitate effective communication between Afghan immigrants and healthcare providers, enabling better delivery of healthcare services.

A notable strength of this study was the proportional sampling relative to the studied population. However, the study also faced limitations. The small sample size reduced its power to detect some statistically significant differences. Additionally, as the research was conducted in a single province, its findings may not be generalizable to other regions of Iran, where variations in service provision to immigrants might arise due to differing regional policies. Given the cultural and social influences of Iranian society on Afghan immigrants during their extended stay in Iran, as well as the observed differences between Iranian and Afghan mothers and neonates in some anthropometric indicators, further comprehensive studies are recommended. Such studies should encompass populations from diverse geographical regions and consider socioeconomic factors to provide a more detailed understanding of these differences.

5.1. Conclusions

The results of this study revealed that although Iranian pregnant mothers gained slightly more weight than Afghan mothers, the weight gain during pregnancy in both groups was within the permissible range outlined by Iran's MOH across various BMI categories. Neonatal anthropometric measures did not show statistically significant differences between newborns of Afghan and Iranian mothers. Logistic regression analysis further demonstrated that nationality did not significantly impact maternal and neonatal parameters within the study population.

The implementation of the guest house project in Semnan and several other provinces in Iran, alongside the recruitment and training of Behbakhsh (community health workers) from Afghan women, has contributed to improving the health conditions of immigrant mothers. Establishing and expanding guest cities, as well as developing community-based educational and service delivery methods such as training Behbakhsh, can help bridge cultural gaps and enhance Afghan mothers' access to health services. These initiatives promote fair access to healthcare for Afghan immigrants in Iran.

Given the lack of official statistics regarding the number of undocumented immigrants in Iran, organizing this population in alignment with national policies could enhance the delivery of health services and improve the health outcomes of Afghan mothers.

References

1. United Nations High Commissioner for Refugees Global Trends. *Forced Displacement in 2020.* 2022. Available from: https://www.unhcr.org/60b638e37/unhcr-global-trends-2020.

2. Kasper A, Mohwinkel LM, Nowak AC, Kolip P. Maternal health care for refugee women - A qualitative review. *Midwif J.* 2022;**104**:103157. [PubMed ID: 34736016]. https://doi.org/10.1016/j.midw.2021.103157.

3. Almeida LM, Caldas J, Ayres-de-Campos D, Salcedo-Barrientos D, Dias S. Maternal healthcare in migrants: a systematic review. *Matern Child Health J.* 2013;**17**(8):1346-54. [PubMed ID: 23334357]. https://doi.org/10.1007/s10995-012-1149-x.

4. Pangas J, Ogunsiji O, Elmir R, Raman S, Liamputtong P, Burns E, et al. Refugee women's experiences negotiating motherhood and maternity care in a new country: A meta-ethnographic review. *Int J Nurs Stud.* 2019;**90**:31-45. [PubMed ID: 30583266]. https://doi.org/10.1016/j.ijnurstu.2018.10.005.

5. Khan A, DeYoung SE. Maternal health services for refugee populations: Exploration of best practices. *Glob Public Health.* 2019;**14**(3):362-74. [PubMed ID: 30187818]. https://doi.org/10.1080/17441692.2018.1516796.

6. Dadras O, Taghizade Z, Dadras F, Alizade L, Seyedalinaghi S, Ono-Kihara M, et al. "It is good, but I can't afford it ..." potential barriers to adequate prenatal care among Afghan women in Iran: a qualitative study in South Tehran. *BMC Pregnancy Childbirth.* 2020;**20**(1):274. [PubMed ID: 32375696]. [PubMed Central ID: PMC7201652]. https://doi.org/10.1186/s12884-020-02969-x.

7. Dadras O, Dadras F, Taghizade Z, Seyedalinaghi S, Ono-Kihara M, Kihara M, et al. Barriers and associated factors for adequate antenatal care among Afghan women in Iran; findings from a community-based survey. *BMC Pregnanc Childbirth.* 2020;**20**(1):427. [PubMed ID: 32723332]. [PubMed Central ID: PMC7389441]. https://doi.org/10.1186/s12884-020-03121-5.

8. Liu L, Ma Y, Wang N, Lin W, Liu Y, Wen D. Maternal body mass index and risk of neonatal adverse outcomes in China: a systematic review and meta-analysis. *BMC Pregnanc Childbirth.* 2019;**19**(1):105. [PubMed ID: 30922244]. [PubMed Central ID: PMC6440121]. https://doi.org/10.1186/s12884-019-2249-z.

9. Vats H, Saxena R, Sachdeva MP, Walia GK, Gupta V. Impact of maternal pre-pregnancy body mass index on maternal, fetal and neonatal adverse outcomes in the worldwide populations: A systematic review and meta-analysis. *Obes Res Clin Pract.* 2021;**15**(6):536-45. [PubMed ID: 34782256]. https://doi.org/10.1016/j.orcp.2021.10.005.

10. Asefzadeh S, Alijanzadeh M, Maleki MR. [Association of anthropometric indices in Iranian and Afghan infants with maternal indices in the Eqbaliyeh health center, Qazvin]. *J Qazvin Univ Med Sci.* 2016;**20**(2):70-3. FA.

11. Rezaeian M, Goujani R, Sheikh Fathollahi M, Vaziri Nejad R, Manshori A, Razi S. [A Comparative Study on Prevalence of Preterm Birth and Low Birth Weight in Iranians and Afghans Races in Rafsanjan Nik-Nafs Hospital in 2011-2012]. *J Rafsanjan Univ Med Sci.* 2014;**13**(1):67-82. FA.

12. Gilmore LA, Redman LM. Weight gain in pregnancy and application of the 2009 IOM guidelines: toward a uniform approach. *Obes J (Silver Spring).* 2015;**23**(3):507-11. [PubMed ID: 25521748]. [PubMed Central ID: PMC4340812]. https://doi.org/10.1002/oby.20951.

13. da Conceição F, Santiago Mda C, Figueiredo MH. Immigrant women's perspective on prenatal and postpartum care: systematic review. *J Immigr Minor Health.* 2015;**17**(1):276-84. [PubMed ID: 24052479]. https://doi.org/10.1007/s10903-013-9915-4.

14. Shin YH, Choi SJ, Kim KW, Yu J, Ahn KM, Kim HY, et al. Association between maternal characteristics and neonatal birth weight in a Korean population living in the Seoul metropolitan area, Korea: a birth cohort study (COCOA). *J Korean Med Sci.* 2013;**28**(4):580-5. [PubMed ID: 23579316]. [PubMed Central ID: PMC3617312]. https://doi.org/10.3346/jkms.2013.28.4.580.

15. Devaki G, Shobha R. Maternal Anthropometry and Low Birth Weight: A Review. *Biomed Pharmacol J.* 2018;**11**(2):815-20. https://doi.org/10.13005/bpj/1436.

16. Nourbakhsh S, Ashrafzadeh S, Hafizi A, Naseh A. Associations between maternal anthropometric characteristics and infant birth weight in Iranian population. *SAGE Open Med.* 2016;**4**:2050312116646690. [PubMed ID: 27231551]. [PubMed Central ID: PMC4871196]. https://doi.org/10.1177/2050312116646691.

17. Bahrami N, Soleimani MA, Rashvand F, Sharif Nia H, Haj Seid Aboutorabi SA, Haj Seid Javadi Z. [Association between seasonal patterns and birth weight]. *Koomesh.* 2012;**13**(4):427-33. FA.

18. Nemmati A, Refahi S, Barak M, Jafari M, Ettehad G. [The relationship between some of maternal anthropometric measurments with neonatal birth weight of Alavi Hospital, Ardebil]. *J Ardabil Univ Med Sci.* 2007;**7**:84-9. FA.

19. Kahnamouei Aghdam F, Asadzadeh F, Dargahi R, Fani R. [The relationship between pre-pregnancy mother's body mass index with the weight of the infants born in Rasht Al-Zahra Hospital.]. *J Health Care.* 2009;**11**:64-70. FA.

20. Najafi S, Amiridelui M, Choobdar F, Sahranavard S, Khalili F. [The Relationship Between Mother's BMI Before Pregnancy with Anthropometric Indicators and Jaundice in Neonates in Gonabad City in 2017]. *Iran J Pediatr Nurs.* 2019;**6**(1):48-53. FA.

21. Das Gupta R, Swasey K, Burrowes V, Hashan MR, Al Kibria GM. Factors associated with low birth weight in Afghanistan: a cross-sectional analysis of the demographic and health survey 2015. *BMJ Open.* 2019;**9**(5). e025715. [PubMed ID: 31092648]. [PubMed Central ID: PMC6530387]. https://doi.org/10.1136/bmjopen-2018-025715.