JOURNAL OF NUTRITION FASTING AND HEALTH

Prevalence of Household Food Insecurity and its Predictive Factors in Pregnant Women of Qazvin Province, Iran

Farnoosh Moafi[1], Zainab Alimoradi[1], Elaheh Farahani[2], Sahar Ebrahimi[2], Hamideh Hajnasiri[1*]

1. Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran.
2. Student Research Committee, Qazvin University of Medical Sciences, Qazvin, Iran.

ARTICLEINFO

Article type:
Research Paper

Article History:
Received: 13 Apr 2025
Accepted: 11 Jun 2025
Published: 21 Mar 2026

Keywords:
Prevalence
Pregnancy
Food insecurity

ABSTRACT

Introduction: The Iranian population faces heightened vulnerability to food insecurity due to multifaceted factors, including poverty, economic instability, climate change, and the protracted socioeconomic impacts of the COVID-19 pandemic. Pregnant women are particularly at risk, necessitating targeted assessments of this critical public health issue. This study aimed to determine the prevalence of food insecurity and its predictors among pregnant women in Qazvin, Iran.

Methods: A cross-sectional study was conducted in Qazvin from 2022 to 2023, enrolling 422 healthy pregnant women attending comprehensive health centers. Data were collected using a researcher-developed checklist for sociodemographic and obstetric characteristics, while food insecurity was assessed via the Household Food Insecurity Access Scale (HFIAS). Logistic regression analysis identified predictors ($P < 0.05$).

Results: Food insecurity prevalence reached 71.4% (95% CI: 66.89-75.51), with 48.9% moderate-to-severe food insecurity. In adjusted analyses, rural residence (OR: 0.20; P: 0.015), smoking (OR: 0.20; P = 0.041), and hookah consumption (OR: 0.29; P: 0.001) were significantly associated with lower food security. Conversely, family income status at the level of savings (OR: 25.10; P< 0.001) and sufficient (OR: 5.18; P< 0.001), supplemental health insurance coverage (OR: 2.05; P: 0.006), and higher maternal education levels (OR: 1.96; P: 0.012) correlated with increased probability of food security.

Conclusion: Food insecurity is prevalent among pregnant women in Qazvin, disproportionately affecting rural populations, those with lower education, inadequate income, lack of supplemental insurance, and substance use (smoking/hookah). Intervention programs should prioritize these high-risk groups to mitigate nutritional disparities.

► Please cite this paper as:
Moafi F, Alimoradi Z, Farahani E, Ebrahimi S, Hajnasiri H. Prevalence of Household Food Insecurity and its Predictive Factors in Pregnant Women of Qazvin Province, Iran. J Nutr Fast Health. 2026; 14(2): 94-101. DOI: 10.22038/JNFH.2025.87418.1577.

Introduction

Food insecurity has emerged as a critical global health challenge over the past decade, currently affecting approximately 2.37 billion people worldwide who experience inadequate access to nutritious foods (1). The United States Department of Agriculture (USDA) defines food insecurity as "the limited or uncertain availability of nutritionally adequate and safe foods, or the inability to acquire acceptable foods through socially acceptable means" (2). However, contemporary understanding extends beyond this definition to encompass multidimensional aspects including: Nutritional adequacy (both quantity and quality), Food safety considerations, Psychosocial dimensions (e.g., feelings of deprivation), Behavioral adaptations (e.g., disrupted eating patterns) and Coping strategies employed by vulnerable households (2, 3).

Women experience higher rates of food insecurity than men throughout their life course, particularly during pregnancy (4, 5). Pregnancy increases nutritional requirements to support fetal development, making women more vulnerable to food insecurity's negative consequences (6). Recent evidence confirms associations between food insecurity and adverse outcomes such as maternal psychological disorders (depression, anxiety, stress, eating disorders), pregnancy complications (excessive gestational weight gain, gestational diabetes, anemia) and Poor fetal

* *Corresponding authors:* Hamideh Hajnasiri, Social Determinants of Health Research Center, Research Institute for Prevention of Non-Communicable Diseases, Qazvin University of Medical Sciences, Qazvin, Iran. Phone: +98 9126954407, Email: f.moafi.sbmu@gmail.com.

outcomes (low birth weight, preterm birth, birth defects) (6-11). In Iran - where 55.9% of the general population faces food insecurity (4) - pregnant women remain particularly affected. The latest systematic review estimates a 45% prevalence among Iranian pregnant women as of 2018 (12). Key contributing factors include household characteristics (size, gravidity), socioeconomic status (education, employment, income), food access limitations, lack of dietary diversity and pregnancy-related expenses (prenatal care costs, newborn necessities) (13, 14).

The Iranian population remains particularly vulnerable to food insecurity due to intersecting environmental and economic challenges. Climate change impacts - especially prolonged droughts - have significantly disrupted agricultural production, food security, and livelihoods (15-17). These climate-related pressures have depressed farm incomes while increasing food prices (18), exacerbating poverty and straining social welfare systems. Three fundamental challenges emerged as primary barriers to food security: persistent economic crises and widespread poverty, inconsistent and fragmented government policies supporting agricultural producers, and climate-related agricultural disruptions. Together, these factors create systemic vulnerabilities in Iran's food security infrastructure (2, 19).

Prior to the COVID-19 pandemic, our research team documented a 44% prevalence of food insecurity among pregnant women in Qazvin City, with significant associations found for maternal unemployment and unplanned pregnancy (20). During the pandemic, food-insecure pregnant women faced impossible tradeoffs - despite understanding the importance of proper nutrition, constrained budgets, pregnancy symptoms, and cognitive overload forced many to prioritize cheap, convenient foods over nutritional quality. Alarmingly, such coping strategies may perpetuate intergenerational cycles of food insecurity, with both immediate and long-term societal consequences (21, 22).

Given this context - combining ongoing economic crises, climate pressures, and pandemic aftermath - coupled with the lack of recent data on pregnant women's food security in Qazvin Province, we aimed to determine the current prevalence of household food insecurity and identify key predictive factors among pregnant women.

Materials and Methods

Study design and Sampling

This cross-sectional descriptive study included 423 pregnant women who were referred to comprehensive health centers in Qazvin between October 2022 and August 2023.

The prevalence of food insecurity in Iran has ranged from 20% to 60%, with rates increasing to 75% in female-headed households and 86% among low-income households (13). Given this wide variation in reported prevalence, we assumed a conservative estimate of 50% for our study. The sample size was calculated as 423, based on this 50% prevalence rate, with $\alpha = 0.05$, $d = 0.05$, and an additional 10% allowance for potential sample loss.

$$n = \frac{Z_{1-a/2}.P(1-P)}{d^2}$$

Sampling was conducted in two stages. First, Qazvin City was divided into five geographical regions, with two health centers randomly selected from each region. Second, eligible pregnant women were informed about the study's purpose, with emphasis placed on information confidentiality. Subsequently, consent forms and questionnaires were distributed via mobile phone links.

Inclusion criteria comprised: literacy (reading/writing ability), smartphone and internet access, and confirmed intrauterine pregnancy. Exclusion criteria included: history of chronic medical conditions, current pregnancy complications, and failure to complete the questionnaire.

Instruments

The data collection tool included Socio-Demographic checklist and Household Food Insecurity Scale Questionnaire.

The socio-demographic checklist, developed by the researchers, collected data on: maternal and spousal education/occupation, maternal age, place of residence, ethnicity, family type, homeownership status, housing size, household income level, basic and supplemental health insurance coverage, gestational age, pregnancy planning status (from both maternal and paternal perspectives), parity (number of children), fetal sex, initiation timing of prenatal care, smoking and hookah use.

The Household Food Insecurity Access Scale (HFIAS) captures the perceptions of household heads regarding their family's food insecurity through conversational statements. Designed as a rapid assessment tool, this scale evaluates the access dimension of food security. Its development was grounded in the fundamental principle that food insecurity represents "a measurable, describable, and analyzable experience." The HFIAS categorizes respondents into four food security status groups: Food secure (score 0-1), Mildly food insecure (score 2-7), Moderately food insecure (score 8-14), Severely food insecure (score 15-27). Salarkia et al. validated this instrument for use in Iranian populations through a comprehensive adaptation process. This included questionnaire modification, cultural adaptation of items and Semi-structured interviews with key stakeholders (health center officials, nutrition experts, and healthcare administrators). The validation study demonstrated excellent internal consistency (Cronbach's α = 0.95), indicating high reliability and validity (23). For our analysis, participants were dichotomized into: Food secure (score 0-1) and Food insecure (score ≥2). The scale maintained strong reliability in our sample (Cronbach's α = 0.88).

Statical Analysis

Following data collection, all entries were processed using SPSS software (version 23). Descriptive statistics were employed to summarize the data, with means and standard deviations used for quantitative variables and frequencies/percentages for categorical variables. To examine associations between predictor variables and food insecurity, we conducted both univariate and multivariate logistic regression analyses. The analytical approach consisted of initial univariate screening of each variable separately, inclusion of variables with $p<0.2$ in subsequent multivariate analysis and final model development using Wald's forward selection method. The threshold for statistical significance was set at $p<0.05$. Missing data were addressed through listwise deletion to ensure data quality. The questionnaire link was sent to 436 women and finally 423 questionnaires were full submitted and their data were analyzed.

Ethical Statement

This study received ethical approval from Qazvin University of Medical Sciences (IR.QUMS.REC.1401.162). All participants were fully informed about the study objectives prior to enrollment. Digital consent forms were distributed via mobile phone links, which participants could complete at their convenience.

Results

Participants had a mean age of 29.44 ± 7.77 years. The majority resided in urban areas, identified as Turkish ethnicity, and lived in rental accommodations. The average housing size was 110.33 m^2, with most living in nuclear family structures. Approximately half of participants and their spouses had attained university education. Most women were homemakers while their spouses were employed. A majority of women reported sufficient household income.

Basic health insurance coverage was common, while supplemental insurance was uncommon. The mean number of children was 0.97±1.07. Most pregnancies were reported as planned by both parents, with prenatal care typically initiated during the first trimester. The mean gestational age at assessment was 20.3 weeks, with female fetuses being slightly more common.

Hookah use was reported by a notable minority of women, while cigarette smoking was less prevalent. Complete demographic characteristics are presented in Table 1.

Food insecurity prevalence reached 71.4% (95% CI: 66.89-75.51) in our sample, with severity stratification presented in Table 2. Initial univariate analysis included all candidate variables (Table 1). Variables retained for multivariate modeling ($p<0.2$ threshold) excluded maternal age, occupational status, gestational age and housing size. The multivariate analysis revealed several significant predictors of food security status: university education nearly doubled the likelihood of food security (OR: 1.96, 95% CI: 1.16-3.32), while sufficient family income increased the odds five-fold (OR: 5.18, 95% CI: 2.51-10.69) and savings-level income showed a twenty-five-fold greater probability (OR:25.10, 95% CI: 7.85-80.3). Supplemental health insurance coverage more than doubled the odds of food security (OR:2.05, 95% CI: 1.22-3.42). Conversely, rural residence decreased the odds by 80% (OR:0.20, 95% CI: 0.05-0.73), as did smoking (OR:0.20, 95% CI: 0.04-0.93), while hookah consumption reduced the probability by 71% (OR:0.29, 95% CI: 0.14-0.59) (Table 3).

Table 1. Socio-Demographic Characteristics and Univariate Logistic Regression Analysis of Food Insecurity Predictors (N=423)

Variable		N(%)	univariate logestic regression					
			β	Standard error	P-Value	OR	CI 95% Upper limit	CI 95% Lower limit
Maternal education*	≤ 12 years	231 (56.6)	1					
	> 12 years	192 (45.4)	1.24	.22	< .001	3.48	2.23	5.43
spousal Education*	≤ 12 years	212 (50.1)	1					
	> 12 years	211 (49.9)	.14	.22	< .001	3.12	1.99	4.90
Maternal Occupation	Housewife	274 (64.8)	1					
	Employement	149 (35.2)	.26	.22	.226	1.30	.84	2.02
Spousal Occupation*	Unemployement	15 (3.5)	1					
	Employement	408 (96.5)	1.76	1.04	.090	5.83	.75	44.85
Place of Residence*	Urban	366 (86.5)	1					
	Rural	57 (13.5)	-2.14	.60	< .001	.11	.03	.38
Ethnicity*	Fars	152 (35.9)	1					
	Tork	238 (56.3)	-1.25	1.09	.252	.28	.03	2.43
	Kord	26 (6.1)	-1.49	.63	.019	.22	.06	.77
	Lor	26 (1.7)	-.52	.22	.019	.59	.38	.91
Family Type*	Nuclear	341 (80.6)	1					
	Extended	82 (19.4)	-.70	.30	.023	.49	.27	.90
Homeownership status*	Tenant	269 (63.6)	1					
	Owner	154 (36.4)	.74	.24	.002	2.11	1.31	3.38
Household income level*	Insufficent	29 (6.9)	1					
	Sufficent	254 (60)	1.96	.35	< .001	7.13	3.56	14.26
	at the level of savings	140 (33.1)	3.53	.52	< .001	34.12	12.09	96.32
Basic Health Insurance Coverage*	No	73 (17.3)	1					
	Yes	350 (82.7)	.94	.34	.006	2.58	1.30	5.09
Supplemental health Insurance Coverage*	No	245 (57.9)	1					
	Yes	178 (42.1)	1.19	.22	< .001	3.31	2.13	5.13
Gestational Age	< 20 weeks	115 (27.2)	1					
	≥ 20 weeks	308 (72.8)	.112	.245	.647	1.11	.69	1.80
Pregnancy planning status (maternal perspectives)*	No	115 (27.2)						
	Yes	308 (72.8)	.48	.25	.058	1.63	.98	2.70
Pregnancy planning status (paternal perspectives)*	No	107 (25.3)	1					
	Yes	316 (74.7)	.79	.28	.005	2.20	1.27	3.82
Fetal sex*	Male	161 (38.1)	1					
	Female	171 (40.4)	-.25	.24	.281	.77	.48	1.23
	Unknown	91 (21.5)	-.49	.30	.101	.61	.34	1.10
Initiation timing of prenatal care*	First trimester	308 (85.8)	1					
	Second trimester	49 (11.6)	-.48	.37	.190	.61	.29	1.27
	Third trimester	11 (2.6)	.31	.63	.624	1.36	.39	4.76
Smoking*	No	396 (93.6)	1					
	Yes	27 (6.4)	-1.68	.74	.024	.18	.04	.79
Hookah Consumption*	No	340 (80.4)	1					
	Yes	83 (19.6)	-.81	.31	.010	.44	.23	.82
Maternal Age		29.44±7.77+	.01	.01	.329	1.01	.98	1.04
Number Of Children*		0.97±1.07+	-.18	.10	.093	.83	.67	1.03
Housing Size		110.33±49.64+	.002	.002	.308	1.00	.99	1.00

* Selected variables to enter into the multivariate regression model
+ Mean ± standard deviation

Table 2. Household Food Insecurity Status among Pregnant Women in Qazvin Province (N=423)

Variable		N (%)	95% CI Upper limit	95% CI Lower limit
Household Food Insecurity Status	Food secure	95 (22.46)	18.72	26.70
	Mildly food insecure	121 (28.61)	24.49	33.11
	Moderately food insecure	83 (19.62)	16.10	23.70
	Severely food insecure	124 (29.31)	25.16	33.84

Table 3. Multivariate Logistic Regression Analysis of Food Insecurity Predictors (Final Model)

Variable		Multivariate logistic regression					
		β	Standard error	P-Value	OR	CI 95% Upper limit	CI 95% Lower limit
Maternal education	≤ 12 years	1					
	> 12 years	.67	.26	.012	1.96	1.16	3.32
Place of Residence	Urban	1					
	Rural	-1.58	.64	.015	.20	.05	.73
Household income level	Insufficient	1					
	Sufficient	1.64	.36	< .001	5.18	2.51	10.69
	at the level of savings	3.22	.59	< .001	25.10	7.85	80.30
Supplemental health insurance Coverage	No	1					
	Yes	.71	.26	.006	2.05	1.22	3.42
Smoking	No	1					
	Yes	-1.60	.78	.041	.20	.04	.93
Hookah use	No	1					
	Yes	-1.21	.31	.001	.29	.14	.59

Hosmer and Lemeshow test: $\chi2=6.046$ df=7 Sig=.534
Model summary: -2 log likelihood=385.427; Cox-Snell R2=.249; Nagelkerke R2=.356
Omnibus test of model coefficients: $\chi2=120.971$ df=7 Sig=0.000

Discussion

This study found a substantially high prevalence of food insecurity (71.4%) among pregnant women in Qazvin Province, with nearly one-third (29.3%) experiencing severe food insecurity. This represents a concerning increase from the 44% prevalence reported in the same population prior to the COVID-19 pandemic (20). The observed deterioration in food security status likely reflects the compounded socioeconomic impacts of the pandemic, particularly on vulnerable populations (24). Supporting this interpretation, a 2020 national review documented both a 30% decline in household purchasing power and significant food price inflation following the pandemic's onset (25). These economic shocks were further exacerbated by pre-existing environmental challenges that constrained Iran's agricultural capacity, creating synergistic pressures on food systems. Together, these factors provide a plausible explanation for both the increased prevalence and severity of food insecurity observed in our study population.

The study's second objective examined socioeconomic and behavioral predictors of food insecurity among pregnant women. Multivariate analysis identified six significant independent predictors: rural residence, lower educational attainment, insufficient family income, lack of supplemental health insurance, smoking, and hookah use. These findings suggest that food insecurity in this population is strongly associated with both structural disadvantages and modifiable risk factors.

Our findings confirm rural residence as a significant predictor of food insecurity, contradicting the common assumption that agricultural proximity ensures food security. Multiple studies corroborate this pattern, demonstrating consistently higher food insecurity rates in rural areas (26, 27). In Iran specifically, rural food security faces multidimensional challenges that Ataei et al. categorized into eight key domains: political, economic, knowledge/information, infrastructural, cultural, food access, climatic, and social factors. Their analysis identified three predominant barriers: (1) recurrent drought conditions, (2) widespread rural household poverty, and (3) inconsistent government agricultural policies (19). These structural challenges align with conflict theory perspectives, which highlight how urban-rural resource disparities generate systemic disadvantages that perpetuate food insecurity in rural communities (28).

In the present study, the increase in maternal education level was related to the decrease in food insecurity. The results of the studies have shown that an increase in the level of education of a woman, even if she is not the head of the household, was associated with the reduction of food insecurity (29, 30). Food insecurity has been known as a gender issue and the limitation in women's educational progress probably has an important role in this gender gap (31). Since the

education is an indicator of a person's social and employment status, the policies addressing gender inequality in education such as investment and early intervention in the girls' initial registration process and continuing education to higher levels can reduce food insecurity (31, 32).

Financial status emerged as a significant predictor of food insecurity in our study. However, conventional indicators like absolute income levels or asset ownership (e.g., houses, vehicles) proved insufficient for reliably predicting household food security across all family types (33, 34). More importantly, our findings align with existing evidence that savings capacity serves as a stronger protective factor against food insecurity, demonstrating consistent predictive value across income strata (33, 34). This suggests that financial resilience - particularly a household's ability to both save money and maintain stable food consumption during economic shocks - may be more determinant of food security than static measures of wealth (35). Notably, our results specifically highlight savings capability as one of the most robust predictors of food security status in this population

Supplemental health insurance coverage emerged as a significant predictor of food security among pregnant women in our study. This finding aligns with existing literature demonstrating that food-insecure individuals are disproportionately covered only by basic health insurance, with limited access to private supplemental coverage (33, 36). The dual coverage of both basic and supplemental insurance - which remains accessible primarily to higher socioeconomic groups - appears to confer substantial advantage, serving as both a marker of socioeconomic status and a protective factor against food insecurity. Importantly, supplemental coverage plays a crucial role in mitigating healthcare cost burdens and ensuring adequate access to medical services (37). These findings underscore the need for expanded access to quality supplemental insurance as a potential intervention for food-insecure families.

Our study found significant associations between both smoking and hookah consumption and increased food insecurity. This aligns with existing evidence demonstrating higher smoking prevalence among food-insecure populations (38). Notably, some studies suggest a bidirectional relationship, identifying food insecurity itself as an independent social determinant of smoking - potentially explained by low-income smokers allocating household resources to cigarettes rather than food (39). This complex interplay raises critical questions about whether smoking exacerbates food insecurity or merely reflects shared socioeconomic determinants (38). Particularly concerning is the elevated smoking prevalence among disadvantaged pregnant women experiencing poverty, low income, and limited education (40-42). Given these overlapping risk factors, smoking should be considered a key indicator when identifying women at high risk for food insecurity.

To our knowledge, this represents the first study to assess food insecurity prevalence among pregnant women in Qazvin following the COVID-19 pandemic. A key methodological strength was the use of multivariate regression analysis, which enabled robust identification of significant predictors while controlling for potential confounders. Several important limitations should be acknowledged. First, the cross-sectional design precludes establishment of causal relationships between identified predictors and food insecurity outcomes. Second, reliance on self-reported measures introduces potential recall bias and social desirability bias in participant responses. Third, while the Household Food Insecurity Access Scale (HFIAS) is a validated instrument, its categorical scoring system provides less detailed nutritional information than quantitative dietary assessment tools.

We recommend future longitudinal studies incorporate objective dietary assessments (e.g., 24-hour recalls or food frequency questionnaires) to better characterize nutritional status and validate our findings. Additionally, qualitative approaches could help elucidate the mechanisms underlying the observed relationships.

Conclusions

Our findings demonstrate a concerning rise in food insecurity among pregnant women following the COVID-19 pandemic, with significant socioeconomic predictors including lower educational attainment, rural residence, insufficient household income, lack of supplemental health insurance, smoking and

hookah use. These results sound an urgent alarm for targeted interventions to protect this vulnerable population. We propose a multi-level intervention framework:

- Structural Interventions include: expand insurance coverage policies for low-income pregnant women and implement rural development programs addressing food access disparities
- Educational Empowerment include: Create continuing education pathways for women, particularly female heads-of-households and develop financial literacy programs focusing on crisis budgeting and resource allocation
- Health Promotion include: integrate tobacco cessation programs with prenatal care services and provide nutrition education tailored to food-insecure households.

Such comprehensive approaches could simultaneously address immediate needs while building long-term resilience against food insecurity.

Declarations

Funding

This study was supported by Qazvin University of Medical Sciences.

Conflicts of Interest

The authors declared no conflicts of interest.

Author's Contribution

Elham Farahani contributed to the research design, data collection, literature review, and writing of specific sections of the manuscript. Zainab Alimoradi contributed to the design of the study, data analysis and critically reviewing the manuscript. Hamideh Hajnasiri contributed to the literature review and writing of specific sections of the manuscript. Farnoosh Moafi provided overall supervision, guided the project direction, and critically revised the manuscript for publication. All authors have read and approved the final version of the manuscript. Sahar Ebrahimi contributed to the data collection and initial data analysis.

Acknowledgements

The researchers would like to thank and appreciate the officials of comprehensive health centers and the study participants.

References

1. Jensen L. The sustainable development goals report. New York: United Nations; 2020.
2. Bickel G, Nord M, Price C, Hamilton W, Cook J. Guide to Measuring Household Food Security, Revised 2000. USDA. 2000.
3. Hanson KL, Connor LM. Food insecurity and dietary quality in US adults and children: a systematic review. Am J Clin Nutr. 2014;100(2):684-92.
4. Matheson J, McIntyre L. Women respondents report higher household food insecurity than do men in similar Canadian households. Public Health Nutr. 2014;17(1):40-8.
5. Arzhang P, Abbasi SH, Sarsangi P, et al. Prevalence of household food insecurity among a healthy Iranian population: A systematic review and meta-analysis. Frontiers in Nutrition. 2022;9: 1006543.
6. Augusto AL, de Abreu Rodrigues AV, Domingos TB, Salles-Costa R. Household food insecurity associated with gestacional and neonatal outcomes: a systematic review. BMC Pregnancy Childbirth. 2020;20(1):229.
7. Laraia BA, Siega-Riz AM, Gundersen C, Dole N. Psychosocial factors and socioeconomic indicators are associated with household food insecurity among pregnant women. J Nutr. 2006;136(1):177-82.
8. Laraia B, Epel E, Siega-Riz AM. Food insecurity with past experience of restrained eating is a recipe for increased gestational weight gain. Appetite. 2013;1(65):178-84.
9. Laraia BA, Siega-Riz AM, Gundersen C. Household food insecurity is associated with self-reported pregravid weight status, gestational weight gain, and pregnancy complications. J Am Diet Assoc. 2010;110(5):692-701.
10. Borders AE, Grobman WA, Amsden LB, Holl JL. Chronic stress and low birth weight neonates in a low-income population of women. Obstet Gynecol. 2007;109(2 Part 1): 331-8.
11. Carmichael SL, Yang W, Herring A, Abrams B, Shaw GM. Maternal food insecurity is associated with increased risk of certain birth defects. J Nutr. 2007;137(9):2087-92.
12. Askari E, Dehkordi FR, Mokhayeri Y, Amraei M, Behzadifar M, Imani-Nasab MH. Food Insecurity among Iranian Pregnant Women: A Systematic Review and Meta-Analysis. IJNMR. 2024;29(4):403-10.
13. Alimoradi Z, Kazemi F, Estaki T, Mirmiran P. Household food security in Iran: systematic review of Iranian articles. Adv Nurs Midwifery. 2015;24(87):63–76.
14. Iqbal S, Ali I. Maternal food insecurity in low-income countries: Revisiting its causes and consequences for maternal and neonatal health. J Agric Food Res. 2021; 3: 100091.
15. Ghalibaf M, Gholami M, Ahmadi S. Climate change, food system, and food security in Iran. Journal of Agricultural Science and Technology. 2023; 25(1):1-17.
16. Quandt A. Coping with drought: Narratives from smallholder farmers in semi-arid Kenya. International Journal of Disaster Risk Reduction. 2021; 57: 102168.

17. Aggarwal P, Singh A. Implications of global climatic change on water and food security. Global change: Impacts on water and food security: Springer. 2009.
18. Hou L, Min S, Huang Q, Huang J. Farmers' perceptions of drought-severity and the impacts on ex-ante and ex-post adaptations to droughts: Evidence from maize farmers in China. Agricultural Water Management. 2023;279: 108180.
19. Ataei P, Sadighi H, Izadi N. Major challenges to achieving food security in rural, Iran. Rural Society. 2021;30(1):15-31.
20. Kazemi F, Moafi F, Siboni FS, Alimoradi Z. Prevalence and predictors of food insecurity among pregnant women: a cross sectional study in Qazvin Province, Iran. Midwifery. 2018;66: 25-9.
21. Zinga J, McKay FH, Lindberg R, van der Pligt P. Experiences of food-insecure pregnant women and factors influencing their food choices. Matern Child Health J. 2022;26(7): 1434-41.
22. Rivington M, King R, Duckett D, et al. UK food and nutrition security during and after the COVID-19 pandemic. Nutr Bull. 2021;46(1):88-97.
23. Salarkia N, Abdollahi M, Amini M, Eslami Amirabadi M. Validation and use of the HFIAS questionnaire for measuring household food insecurity in Varamin-2009. IJEM. 2011;13(4):374-83.
24. Kleve S, Bennett CJ, Davidson ZE, et al. Food insecurity prevalence, severity and determinants in australian households during the COVID-19 pandemic from the perspective of women. Nutrients. 2021;13(12):4262.
25. Rad AK, Shamshiri RR, Azarm H, Balasundram SK, Sultan M. Effects of the COVID-19 pandemic on food security and agriculture in Iran: a survey. Sustainability. 2021;13(18):10103.
26. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A. Household food security in the United States in 2018. Economic Research Report. 2019;270.
27. DeWitt E, Gillespie R, Norman-Burgdolf H, Cardarelli KM, Slone S, Gustafson A. Rural SNAP participants and food insecurity: how can communities leverage resources to meet the growing food insecurity status of rural and low-income residents?. Int J Environ Res Public Health. 2020;17(17):6037.
28. Turner JH. Theoretical sociology: a concise introduction to twelve sociological theories. Los Angeles: SAGE Publications; 2013.
29. Demétrio F, Teles CA, Santos DB, Pereira M. Food insecurity in pregnant women is associated with social determinants and nutritional outcomes: a systematic review and meta-analysis. Cien Saude Colet. 2020;25: 2663-76.
30. Sullivan K, St John M, DeFranco E, Kelly E. Food insecurity in an urban pregnancy cohort. Am J Perinatol. 2023;40(1):57-61.
31. Broussard NH. What explains gender differences in food insecurity?. Food Policy. 2019;83: 180-94.
32. Grimaccia E, Naccarato A. Food insecurity in Europe: A gender perspective. Soc Indic Res. 2022;161(2):649-67.
33. Dean EB, French MT, Mortensen K. Food insecurity, health care utilization, and health care expenditures. Health Serv Res. 2020;55: 883-93.
34. Guo B. Household assets and food security: Evidence from the survey of program dynamics. JFEI. 2011;32: 98-110.
35. Chang Y, Chatterjee S, Kim J. Household finance and food insecurity. JFEI. 2014;35:499-515.
36. Johnson KT, Palakshappa D, Basu S, Seligman H, Berkowitz SA. Examining the bidirectional relationship between food insecurity and healthcare spending. Health Serv Res. 2021;56(5):864-73.
37. Bertoldo J, Wolfson JA, Sundermeir SM, et al. Food insecurity and delayed or forgone medical care during the COVID-19 pandemic. Am J Public Health 2022;112(5):776-85.
38. Farrelly MC, Shafer PR. Comparing trends between food insecurity and cigarette smoking among adults in the United States, 1998 to 2011. Am J Health Promot. 2017;31(5):413-6.
39. Poghosyan H, Moen EL, Kim D, Manjourides J, Cooley ME. Social and structural determinants of smoking status and quit attempts among adults living in 12 US states, 2015. Am J Health Promot. 2019;33(4):498-506.
40. Hunt BR, Whitman S. Maternal smoking in Chicago: a community-level analysis. J Health Care Poor Underserved. 2011;22(1):194-210.
41. Martin LT, McNamara M, Milot A, Bloch M, Hair EC, Halle T. Correlates of smoking before, during, and after pregnancy. Am J Health Behav. 2008;32(3):272-82.
42. Wakschlag LS, Pickett KE, Middlecamp MK, Walton LL, Tenzer P, Leventhal BL. Pregnant smokers who quit, pregnant smokers who don't: does history of problem behavior make a difference?. Soc Sci Med. 2003;56(12):2449-60.