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Health Survey Using the SF-12 Questionnaire and Related Factors among Mothers with Children 0-5 Years Old in Iran: A Population-Based Cross-Sectional Study, 2019-20

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ABSTRACT

The mother is considered the primary individual responsible for providing care and support to her child, particularly in the early stages of life. The aim of this study was to consider health status and related factors including health literacy among mothers with children 0-5 years old in Arak. This cross-sectional study was performed on 1483 mothers in Arak in 2019-20. Health status and Health Literacy were assessed using the SF-12 and HELIA questionnaires. Principal components analysis using asset data was used to create socio-economic status. Moreover, one-sample t-test, univariate and multiple linear regression models were applied. P-values less than 0.05 were considered as statistically significant. The data were analyzed through SPSS 16.0 and STATA 12.0 software. The mean age of mothers was 31.8 ± 5.4 . The mean scores of Physical Component Summary (PCS), Mental Component Summary (MCS) and all items of SF-12 were 48.3 ± 6.1 , 38.4 ± 7.7 and 43.4 ± 6.9 , respectively, that were significantly lower compared to the norm-based scores in the US population ($p=0.001$). There was a significant association between the mother's PCS and the age of the mother ($p=0.015$) and health literacy ($p=0.001$) in the linear regression. Furthermore, there were significant associations among mother's MCS and age of children ($p=0.016$), SES and health literacy ($p=0.001$). The mothers in the present study had a low health status. Interventions to improve maternal mental health and health literacy may enhance family well-being.

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Introduction

Quality of life is defined by the World Health Organization as “an individual's perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (1).

Nowadays, in relation to the subject of cultural and social development, quality of life and level of one's satisfaction in different domains and aspects of life are of great importance. As a general rule, there are 3 domains that are specifically related to quality of life, including physical, personal and social domains. In the physical domain, we can mention basic needs, consisting of home, clothing, food and in the personal domain, we can refer to factors such as wealth, family, friends and the protection of close ones. As well as social factors, we can allude to situations where in people participate in social activities (2-3).

Health literacy is considered an important determinant influencing maternal health outcomes, as highlighted in recent studies (4-5). Mothers with an adequate level of health literacy have the ability to take responsibility for their own health as well as their family's health and the community's health. Also, various studies have indicated the huge impact of mothers on protecting family members from the recent COVID-19 pandemic (6-8). In a study regarding health literacy in Iran, the mean score for health literacy in women in Iran was 69.02. Hersh et al. indicated that more than one-third of US adults have limited health literacy, which contributes to poor health outcomes and affects the of the patients and health care access and quality (9). In the studies conducted on English women (10) and American women (11), factors such as maternal age, maternal and spouse educational level, socioeconomic situation and number of children were identified as factors greatly influencing maternal quality of life.

The Mother is considered the primary individual responsible for providing care and support to her child, particularly in the early stages of life. Therefore, mothers need to obtain an adequate physical and mental health status. Few studies

have been conducted on this subject. Thus, we aimed to consider health status and related factors including health literacy among mothers with children 0-5 years old in Arak, Iran.

This cross-sectional study was conducted in Arak in the center of Iran, during 2019-20. The subjects were mothers with children aged 0-5 years. Arak was divided into 50 parts based on 50 existing health care centers. The sampling frame is mothers registered in health centers; therefore, a population-based sample is drawn from registered mothers using random selection within health centers. These centers provide health services for the covered population, including mothers and their children. Therefore, the interviewers referred to the participants' houses. The consent was gained before completing the related questionnaires. In total, 37172 mothers had the inclusion criteria and 1754 mothers were invited to participate. Finally, 1483 mothers participated in the study with a response rate of 85%. The questionnaires were defined on an Android app on the interviewers' cell phones. The interviewees were trained to complete the questionnaires. Inclusion criteria for this study consisted of mothers of children aged 5 years old and younger and mothers who were registered in health care centers. Mothers who were not available at the house door, due to any reason, were excluded from the study.

The variables of our study included maternal age (years), children's age (years) and children's sex (boy/girl), educational level (Illiterate and preliminary, Guidance school, High school, Diploma, Higher diploma, undergraduate and postgraduate), husband's educational level (Illiterate and preliminary, Guidance school, High school, Diploma, Higher diploma, undergraduate and postgraduate), occupational status (unemployed, housekeeper, temporary job, permanent job), husband's occupational status (unemployed, temporary job, permanent job), parity (count), insurance coverage (yes, no), children's birth weight (gram) and socio-economic status (SES) (1st to 5th quintiles based on assets). SES was obtained based on the assets, including having a usual refrigerator, side by side refrigerator, color TV, LCD TV, LED TV, cell phone, washing machine, dishwasher, microwave,

vacuum cleaner, motorcycle, laptop, access to the internet at home, owning a car, owning a home, number of bedrooms, sanitation facility, bathroom, cooling equipment, heating devices, cooking equipment and place of cooking at home.

Health literacy was collected by the Health Literacy for Iranian Adults (HELIA) questionnaire on a 5-point Likert scale. Tavousi et al (12) developed and validated the HELIA questionnaire in 2020. The structural validity of the HELIA were examined and confirmed by Tavousi et al (12). The reliability test showed that all factors had acceptable internal consistency. The Cronbach's alpha coefficient for each subscale and the questionnaire as a whole ranged from 0.72 to 0.89. To calculate each subscale and total scores for the HELIA, we used a scoring manual based on the study by Tavousi et al (12). In this study, the reliability of the HELIA was calculated, as Cronbach's alpha coefficient for each subscale ranged from 0.89 to 0.94 and the questionnaire as a whole was 0.92.

The Short Form 36 Health Survey Questionnaire (the SF-36) was developed by Ware et al (13) in 1987. The SF-12 is a multipurpose short-form (SF) generic measure of health status that was developed by Ware et al (14). The validity of SF-12 came from the National Survey of Functional Health Status, which normed the SF-36 Health Survey and the Medical Outcomes Study, an observational study of health outcomes for patients with chronic conditions. Construct validation is referred to as known groups validity. The SF-12 was expected to discriminate between groups of patients who differ according to proven clinical measures. PCS-12 and MSC_12 summary scales were expected to differ considerably based on the factor analytic studies of construct validity. A minimally 90% accuracy from SF-36 was obtained by SF-12(15). SF-12 scores range from 0 to 100, with the higher scores indicating better health. The summary scores are norm-based with a mean score of 50 and the standard deviation (SD) of 10 in a statistical population in the US. The scoring was suggested by Ware et al (15). It is a 12-item valid questionnaire developed from the SF-36, which includes one or two items from eight health concepts, including physical functioning, role limitations due to physical health

problems, bodily pain, general health perception (related to PCS), vitality, social functioning, role limitations due to emotional problems and mental health (related to MCS) on Likert scales. Answers to questions of these subscales are considered in the Physical Component Summary (PCS) and Mental Component Summary (MCS) scale scores. (15). We used the Persian translation of the SF-12, which was validated by Montazeri et al (16), so that Cronbach's α for PCS-12 and MCS-12 was 0.73 and 0.72, respectively. Furthermore, correlations between the SF-12 scales and single items showed that the physical functioning, role physical, bodily pain and general health subscales correlated higher with the PCS-12 score and the vitality, social functioning, role emotional and mental health subscales correlated more with the MCS-12 score; therefore, there was good convergent validity. The principal component analysis indicated a two-factor structure (physical and mental health) that accounted for 57.8% of the variance. The confirmatory factor analysis also indicated a good fit to the data (16). Finally, the reliability of the SF-12 in this study via Cronbach's α for PCS-12 and MCS-12 was 0.65 and 0.68, respectively.

1. Statistical Analysis

The household wealth can be concluded by income, consumption or expenditure measures. However, these data are always susceptible to information bias (17). Given that the application of principal components analysis (PCA) using asset data in creating socio-economic status (SES) indices was used routinely (18-20). The PCA was applied to such data to derive a SES measure and then households were grouped into pre-determined categories, such as quintiles, reflecting different SES levels. Details of PCA were discussed elsewhere (18-19). Briefly, in PCA, the first component explains the largest proportion of the total variance, so assets that were more unequally distributed across the sample had a higher weight in the first component. We used the weights (coefficients) for each asset from this first component to generate the wealth scores, so that higher scores indicated higher wealth status and vice versa. Finally, based on quintiles, the scores were converted to five ordered categories from poorest (1st quintile) to richest (5th quintile), to

determine each household's wealth status (21). PCA is a multivariate model in order to diminish of the asset's variables into a smaller number. In other words, on a set of correlated variables, PCA creates uncorrelated components, so each component is a linear weighted combination of the initial variables. The weights for each principal component are given by the eigenvectors of the covariance matrix or correlation matrix. The variance of the principal component is determined by the eigenvalue of the related eigenvector (18).

Frequency, mean and SD were calculated for the study variables. A one-sample t-test was used to compare the mean scores of PCS and MCS with the norm-based scores in the US population. Univariate and multiple linear regression models were applied to assess the determinants of PCS and MCS. The backward method was used for the included variables in the multiple linear

regressions with a p-value<0.2. All analyses were applied using SPSS 16.0 and STATA 12.0 software. P-values of less than 0.05 were considered statistically significant.

This work was approved by the ethics committee in Arak University of Medical Sciences (Ethic code: IR.ARAKMU.REC.1398.217). Furthermore, informed consent was obtained from all participants.

A total of 1483 mothers with children aged 0-5 years were included in this analysis. The majority of the respondents were mothers with boys (772 (52.1%)), covered by insurance (1381 (93.1%)) and housekeepers (1308 (88.2%)). Mothers with a diploma had 564 (38%) and those with only one child had 692 (46.7%). The mean age of mothers was 31.8 ± 5.4 . Furthermore, the average birth weight and health literacy score of children were 3174 ± 466.7 grams and 70.16 ± 17.55 , respectively.

Table 1: Demographic characteristics of mothers with children aged 0-5 years old in this study.

Variables		N(%)
Education	Illiterate and preliminary	99(6.7)
	Guidance school	183(12.3)
	High school	60(4.0)
	Diploma	564(38.0)
	Higher diploma	115(7.8)
	undergraduate	396(26.7)
	postgraduate	66(4.5)
Husband's education	Illiterate and preliminary	102(6.9)
	Guidance school	188(12.7)
	High school	66(4.5)
	Diploma	560(37.8)
	Higher diploma	149(10.0)
	undergraduate	302(20.4)
	postgraduate	116(7.8)
Job	unemployment	6(0.4)
	housekeeper	1308(88.2)
	Temporary job	45(3.0)
	Permanent job	124(8.4)

Variables		N(%)
Husband's job	Temporary job	563(38.0)
	Permanent job	905(61.0)
Parity	1	692(46.7)
	2	631(42.5)
	3	138(9.3)
	4	19(1.3)
	5	3(0.2)
Socio-economic status	1 st quintile	297(20)
	2 nd quintile	297(20)
	3 rd quintile	296(20)
	4 th quintile	297(20)
	5 th quintile	296(20)

The mean PCS and MCS scores of the participants (PCS 48.3±6.1) and MCS 38.4±7.7)) were significantly lower compared to the scores of

the participants in US with the mean score of 50 (p=0.001).

Table 2: The comparison of mean physical and mental scores with standardized US average of 50

Variable	Mean±SD	t value	CI 95%	p-value
Physical score	48.3±6.1	-8.7	-2.1, -1.3	0.001
Mental score	38.4±7.7	-45.9	-12.1, -11.1	0.001

There were statistically significant associations between mother's PCS and age of mother (p=0.015)

and health literacy (p=0.001) in final model of multiple linear regression analysis.

Table 3: Association between maternal PCS and independent variables in univariate and multiple linear regression analysis, 2019-20.

Variable	Simple Linear Regression				Multiple Linear Regression*			
	Regression Coefficient	Standardized Coefficient	SE**	p-value	Regression Coefficient	Standardized Coefficient	SE**	p-value
Children sex								-
boy	ref							
girl	0.02	0.01	0.4	0.951				
Age of children	0.11	0.03	0.13	0.393				-
Age of mother	-0.07	-0.06	0.04	0.083	-0.08	-0.07	0.04	0.015
Mother education								-

Variable	Simple Linear Regression				Multiple Linear Regression*			
	Regression Coefficient	Standardized Coefficient	SE**	p-value	Regression Coefficient	Standardized Coefficient	SE**	p-value
Illiterate and preliminary	ref							
Guidance school	-0.16	-0.01	0.93	0.865				
High school	-0.94	-0.03	1.29	0.464				
Diploma	0.06	0.01	0.82	0.944				
Higher diploma	0.83	0.04	1.04	0.426				
undergraduate	1.36	0.1	0.85	0.110				
postgraduate	1.05	0.04	1.20	0.382				
Father education								-
Illiterate and preliminary	Ref							
Guidance school	0.19	0.01	0.94	0.836				
High school	-3.98	-0.14	1.18	0.001				
Diploma	-0.25	-0.02	0.83	0.760				
Higher diploma	0.36	0.02	0.98	0.713				
undergraduate	0.57	0.04	0.88	0.513				
postgraduate	2.04	0.09	1.06	0.054				
Mother job								-
unemployment	ref							
housekeeper	-5.20	-0.27	3.0	0.087				
Temporary job	-6.1	-0.17	3.2	0.059				
Permanent job	-3.05	-0.13	3.1	0.327				
Father job								
Temporary job	ref							
Permanent job	2.9	3.7	0.4	0.001				
Parity	-0.3	-0.04	0.3	0.271				-
Birth weight	-0.01	-0.01	0.01	0.803				-
Insurance coverage								-
No	ref							
Yes	-0.3	-0.01	0.8	0.678				
Socio-economic status	0.01			0.181				-
1 st quintile	ref							
2 nd quintile	0.4	0.02	0.6	0.582				
3 rd quintile	-0.1	-0.01	0.6	0.892				
4 th quintile	1.3	0.08	0.7	0.050				
5 th quintile	1.4	0.09	0.7	0.032				
Health literacy	0.05	0.15	0.01	0.001	0.06	0.16	0.01	0.001

* Exclude the variables with P>0.1; ** SE, Standard Error; R²=11.4%

Furthermore, there were significant associations among children's MCS and age of children (regression coefficient = -0.39, $p = 0.016$), all categories of SES and health literacy (regression

coefficient = 0.06, $p = 0.001$) in final model of multiple regression models.

Table 4: Association between maternal MCS and independent variables in univariate and multiple linear regression analysis, 2019-2020.

Variable	Simple Linear Regression				Multiple Linear Regression*			
	Regression Coefficient	Standardized Coefficient	SE**	p-value	Regression Coefficient	Standardized Coefficient	SE**	p-value
Children sex								
Boy	ref							
Girl	0.59	0.04	0.51	0.241				-
Age of children	-0.37	-0.07	0.16	0.026	-0.39	-0.08	0.16	0.016
Age of mother	-0.04	-0.03	0.05	0.448	-			-
Mother education								
Illiterate and preliminary	ref							
Guidance school	-0.38	-0.02	1.18	0.746				
High school	-1.66	-0.04	1.63	0.310				
Diploma	1.55	0.10	1.04	0.137				
Higher diploma	2.58	0.09	1.32	0.052				
Undergraduate	1.21	0.07	1.08	0.264				
postgraduate	2.93	0.08	1.53	0.055				
Father education	-0.20			0.373				-
Illiterate and preliminary	ref							
Guidance school	1.57	0.07	1.20	0.191				
High school	2.45	0.07	1.52	0.107				
Diploma	0.92	0.06	1.06	0.387				
Higher diploma	1.99	0.08	1.25	0.113				
Undergraduate	2.76	0.14	1.13	0.014				
postgraduate	2.93	0.10	1.36	0.031				
Mother occupation								
Unemployment	ref							
housekeeper	-4.17	-0.17	3.87	0.283				
Temporary job	-2.48	-0.05	4.13	0.549				
Permanent job	-3.39	-0.12	3.97	0.394				
Father occupation								
Temporary job	ref				-			-

Variable	Simple Linear Regression				Multiple Linear Regression*			
	Regression Coefficient	Standardized Coefficient	SE**	p-value	Regression Coefficient	Standardized Coefficient	SE**	p-value
Permanent job	1.53	2.54	0.52	0.003				
Parity	-0.46	-0.05	0.33	0.167				-
Birth weight	0.01	0.02	0.01	0.580				-
Insurance coverage	0.12			0.906				-
No	ref							
Yes	0.87	0.03	0.97	0.373				
Socio-economic status								
1 st quintile	ref				ref			
2 nd quintile	3.04	0.16	0.81	0.001	2.57	0.14	0.81	0.002
3 rd quintile	3.95	0.21	0.81	0.001	3.32	0.18	0.83	0.001
4 th quintile	3.09	0.16	0.82	0.001	2.34	0.12	0.84	0.005
5 th quintile	4.34	0.23	0.82	0.001	3.16	0.16	0.87	0.001
Health literacy	0.07	0.17	0.01	0.001	0.06	0.12	0.02	0.001

* Exclude the variables with $P > 0.1$; ** SE: Standard error; $R^2 = 5.3\%$

This population-based cross-sectional study investigated the health status of mothers with children aged 0-5 years in Iran using the SF-12 questionnaire and explored associated sociodemographic and health-related factors. The findings revealed that both the physical component summary (PCS) and mental component summary (MCS) scores of participating mothers were significantly lower compared with the reference scores from the U.S. population. This suggests that Iranian mothers of young children may experience a lower health-related quality of life (HRQoL), particularly in mental health dimensions.

In this study, our findings indicate that the health status of mothers is affected by numerous factors such as maternal age, spouse's work, socio-economic situation and mother's health literacy. Also, other studies presented that age may affect women's quality of life (11, 22-24). However, in the study by Turkish researchers Oran et al, results presented a negative association between physical health situation and mother's age (25). A

study on mothers during the pregnancy period could explain the differences in the results of the Oran study from our study. Another study reported that the mental and physical quality of life in pregnant women is less than that of others (26).

In comparison with our study, Zarinfar et al (27) reported lower PCS scores among older adults with osteoporosis (women: 38.1 vs. 40.2; men: 44.3 vs. 45.8) but no significant differences in MCS scores. This contrast highlights that while in elderly populations physical health is more strongly compromised, in mothers with young children, mental health appears to be more vulnerable.

The mean PCS score (48.3) was only slightly below the U.S. norm of 50, but the mean MCS score (38.4) was substantially lower, highlighting greater vulnerability in mental health compared to physical health. This is consistent with prior studies from low- and middle-income countries reporting that mothers of young children face considerable psychological strain, often due to

social, cultural and economic challenges such as limited social support, childcare burden and restricted access to mental health services (28).

In 2013, Radermacher et al presented that overall satisfaction with life is medium (mean) between European and the quality of life in men was the same as that of women. (29). Moreover, our results showed that mothers with young children had lower MCS scores compared to PCS, suggesting greater vulnerability in mental health. In contrast, Abasi et al (30) reported that among pregnant women in Iran, physical health was the lowest and mental health was the highest aspect of quality of life. This difference may indicate that while pregnancy is more strongly associated with reduced physical functioning, the postpartum period and early motherhood may be more strongly linked to psychological strain.

Our results showed that a higher education level is significantly associated with a higher quality of life. This finding is supported by various studies, and even age-adjusted studies showed a stronger association between education and quality of life (11, 23). Furthermore, the study by Alinejad-Tilaki et al. (2024) showed that health literacy plays a decisive role in the mental health and quality of life of new students and may act as an important predictor of the mental health and quality of life of individuals. These results emphasize that improving the level of health literacy not only in academic groups but also among vulnerable groups, such as mothers with young children; can be a key strategy for improving the quality of life and mental health (31).

Unlike our study, other studies suggested a significant association between the mother's occupation and quality of life. Limbers et al reported that employed mothers had a higher quality of life in the USA (11). This difference could be explained by the limited number of employed mothers in this study. In a study in Turkey, similar to the previous study, employment status was associated with quality of life (25). There was a significant relationship between quality of life, mental health and socioeconomic situation in the available findings.

This result was supported by similar studies (25, 32).

A study on Portuguese women (33) and a study on English women (9) showed that a lower socioeconomic situation is associated with substandard health status. This can be due to less access to health care and less knowledge of the factors affecting the health and health literacy of mothers.

Another study was done by Michelson N. et al in 2016 to evaluate the psychological distress in mothers of 5-year-old children. In this study, subjective social status (SSS), Community ladder ranking and socioeconomic status (SES) ladder ranking were assessed. They demonstrated a significant association between Community ladder ranking and depressive symptoms ($b=-1.34$, $SE=0.52$, $p<.05$). This study showed that lower SES and community ladder ranking might increase the risk of depressive symptoms and anxiety. Also, it decreases perceived social support. Generally, this study reported a significant association between both the SES ladder and community ladder ranking and maternal well-being (34). Additionally, Linares D. et al showed poor mental health was significantly associated with age, U.S.-born status (AOR: 2.31, 95% CI: 1.48-3.63), poor physical health (AOR: 8.69, 95% CI: 5.81-13.02), having a child with a special health care need (AOR: 1.65, 95% CI: 1.03-2.64), experiencing food insecurity (afford enough food, yet, unhealthy [AOR: 2.74, 95% CI: 1.59-4.70] and sometimes/often not afford enough food [AOR: 3.20, 95% CI: 1.76-5.84]) and low social capital (AOR: 1.97, 95% CI: 1.04-3.73). This study demonstrated that poor mental health is more prevalent in younger mothers (aged 18-20 years) than in older ones (35).

In this study, no significant association was found between the gender of the child and quality of life in mothers. Furthermore, in available consideration, mothers who had a male child had a lower quality of life and were at a higher risk of mental disorders (36). In different societies, the style of training can cause a huge impact in this field. As a general rule, it is necessary for the hygiene policymakers to consider hygiene and care contents in mothers who have children under

5 years, due to the low quality of life in women. Therefore, we offer that hygiene programmers provide high-quality education courses that can increase the quality of life in society (37). The strengths of this study were a large sample size of the mothers with children 5 years old and younger in the study setting and the high response rate of participation, which led to a lower possibility of selection bias. One limitation of this study is the lack of information on non-respondents. Since we could not compare respondents with non-respondents, the possibility of non-response bias cannot be excluded.

Conclusion

This study concluded that mothers with children aged 0–5 years in Iran have lower physical and especially mental health status compared to U.S. norms, as measured by the SF-12. Maternal age and health literacy were key determinants of physical health, while child age, SES and health literacy were significantly associated with maternal mental health. These findings highlight the importance of enhancing health literacy and providing targeted support for mothers, particularly those of lower socioeconomic status and with older children. Policies and interventions should focus on empowering mothers with the knowledge and resources needed to improve their health outcomes, which may also have beneficial effects on child well-being.

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Authorship

Javad Nazari: Writing - review & editing, Writing - original draft, Visualization, Validation, Supervision, Software, Resources, Project

administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. Nahid Chezani-Sharahi: Writing - review & editing, Visualization, Supervision, Project administration, Investigation, Data curation. Yeganeh Karimi: Writing - review & editing, Validation, Project administration, Data curation. Mobin Naghshbandi: Writing - review & editing, Software, Data curation. Rahmatollah Moradzadeh: Writing - review & editing, Writing - original draft, Visualization, Validation, Supervision, Software, Resources, Project administration, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. Mohsen Shamsi: Writing - review & editing, Visualization, Supervision. Babak Eshrati: Methodology, Investigation, Formal analysis, Data curation.

Conflict of Interest Statement

The authors declare no conflict of interest.

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