Original Article

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The Relationship between Maternal Mental Health and the Development of Infants Under One Year of Age

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ABSTRACT

BACKGROUND AND OBJECTIVE: Maternal mental health is one of the factors affecting the development of the child, especially in the early years of life. Since lack of attention to development of infants and the following complications may lead to irreparable consequences, this study was performed to investigate the relationship between maternal mental health and the development of infants under one year of age.

METHODS: This cross-sectional study was performed on 200 mothers with infants aged 12 months who referred to Babol health centers in 2018. The required data were collected using demographic questionnaire, Goldberg General Health Questionnaire (GHQ-28) (score 21 and below means health and 22 and above means disorder) and the Spielberger State-Trait Anxiety Inventory (STAI) (scores between 20-34 are minimum, 35-45 mild, 46-54 average and greater than or equal to 57 are defined as severe).

FINDINGS: The mean age of mothers in this study was 29.8±5.13 years. 29% of mothers had symptoms of mental disorder. The mean score of maternal general health was 19.20±11.89 and the mean score of the depression component was 2.45±3.62. In Spielberger State-Trait Anxiety Inventory, there was a difference in infant weight index between growth percentiles of 15-50% and 50-85% at birth (p=0.015). However, no significant difference was observed with the growth process. Goldberg General Health Questionnaire (GHQ-28) did not show a significant relationship with infants' weight, height and head circumference at the end of one year. All infants had a normal growth pattern in all three indices of weight, height and head circumference.

CONCLUSION: The results showed that there is a relationship between maternal mental health and infant birth weight. But in the growth process, there is no relationship between infants' growth indicators and mothers' mental health.

KEY WORDS: *Mental Health, Growth, Infant, Mother.*

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Introduction

According to the World Health Organization (WHO), health is a state of complete physical, mental, and social well-being, and not just the absence of disease and disability. One of the most important issues in human life is mental health and knowing how to achieve it (1). Mental health is one of the key psychological concepts and is one of the important issues in the growth and prosperity of family and society (1). Pregnancy, childbirth and the postpartum period are very important periods in a woman's life. Psychological changes occur in parents during pregnancy. The tangible evidence of a fetus often increases a woman's emotions. Before birth, the baby is affected by many factors that occur in the safe environment of the uterus and cause individual differences in the baby. Mothers with high levels of anxiety may give birth to hyperactive and irritable children who have sleep disorders, low birth weight, and malnutrition (2).

Increasing the contact between mother and child during the first days of life may enhance mother-child interactions in the long run. Children grow physiologically and psychologically based on their social relationships; any description of the infant's developmental status should also include the role of the parents (3). Children are the most valuable creatures and one of the most vulnerable groups and need special attention. Therefore, factors that may have adverse effects on the child's development will threaten his/her life. In addition, the late physical and psychological effects will greatly affect his future. Therefore, paying attention to children's health issues is one of the most important, fundamental and constructive factors that should be considered in health matters (4).

Measuring the children's growth is a way to measure their nutritional status and overall health (5). Child development reflects perfect health, chronic diseases, and interpersonal and psychological stress. The psychological changes experienced by parents during pregnancy greatly affect the lives of all family members (3). The results of the study by Emerson et al. showed that mothers who experienced mental health disorders, including depression and PTSD, their children needed more support for breastfeeding, and encouraging fathers to take responsibility for reducing mental disorders had a positive effect on child health (6). The results of a study by Wemakor et al. showed that maternal depression was highly prevalent in northern Ghana and was associated with developmental disorder in children (7). A study by Patel et al. showed that postpartum depression is a strong and independent predictor of low birth weight and height (8). One study found that infants of depressed mothers were at risk for lack of continuous development, negative emotions, and uncontrolled arousal. Infants of depressed mothers are also at risk of developing poor self-control, internal and external problems, cognitive dysfunction, and poor social interaction with parents (9). Considering the importance of maternal mental health and infants' development, since no research has been done in Mazandaran province and city of Babol regarding the relationship between maternal mental health and infants' growth, this study was conducted to investigate the relationship between maternal mental health and the development of infants under one year of age to create the necessary conditions to promote the mental health of mothers if necessary.

Methods

This cross-sectional study was approved by the ethics committee of Babol University of Medical Sciences with the code IR.MUBABOL.HRI.REC.1397.143 and was conducted on 200 literate mothers with primary education whose children were 12 months old and referred to the health centers of 22 Bahman and Shohadaye Gomnam in Babol for vaccination. After obtaining informed consent, the questionnaire was completed by mothers under the supervision of a trained psychologist. If subjects did not cooperate in completing the mental health questionnaires, illiterate mothers, infants with genetic diseases, infants with Turner syndrome or Down's syndrome, infants with metabolic diseases and premature infants were excluded from the study. The sample size was estimated with 95% confidence and 80% test power at least 200 cases.

Demographic information was completed in the questionnaire and mothers' education was divided into below high school diploma, high school diploma, above high school diploma and family income level was divided into low, medium and high. Low income level was defined as a monthly income of less than 2 million and five hundred thousand Tomans, average income level as income between 2 million and five hundred thousand Tomans to five million Tomans and high income level as a monthly income above five million Tomans for a family of four. Child growth indicators including height, weight, and head circumference and growth process were completed by a trained midwifery expert using the infant growth card. To assess mental health, two general health questionnaires of Goldberg

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General Health Questionnaire (GHQ-28) (10) and Spielberger State-Trait Anxiety Inventory (STAI) (11) were used, the validity and reliability of which have been standardized in Iranian studies.

The General Health Questionnaire (GHQ-28) was designed by Goldberg in 1972 and examines a person's mental state in the last month in four areas: somatization, anxiety and psychological distress, social dysfunction, and depression. Based on the cut-off point in the questionnaire, people with a score of 21 and below were in the healthy group and people with a score of 22 and above were in the group of people with the disorder. Goldberg meta-analysis studies showed that the average sensitivity of the questionnaire is 84% and its average specificity is 82%. This questionnaire has Iranian validity (10). The Spielberger State-Trait Anxiety Inventory, which is related to state anxiety and trait anxiety, is defined as a score between 20-34 as minimum, mild as 35-45, moderate as 46-54 and greater than or equal to 57 as severe. This questionnaire has Iranian validity (11).

Children's growth was also quantitatively and qualitatively measured according to WHO standard growth charts to measure height, weight and head circumference. Infants were exclusively breastfed until 6 months of age and then supplemented with age-appropriate food as recommended by health centers. Infants' growth was measured by a skilled and trained expert with a height gauge, scale, and tape measure. Infants' height was measured lying down using a SKA height meter (Germany) with an accuracy of one millimeter. Head circumference was measured using a tape measure (an accuracy of one millimeter) as the largest diameter from Glabella to the occiput. The weight was measured with a SKA scale (made in Germany) with an accuracy of 5 grams with the least possible clothing in the comfort of the infant.

To fully interpret child development, all 3 curves of child growth, weight for age, height for age, and head circumference for age were plotted. In standard growth charts of WHO, the evaluation is done according to the Z-score criterion and Z-score is the unit of standard deviation from the median of the population. These charts define normal growth between -2SD and +2SD and between -2Z-score and +2Z-score, which roughly correspond to the 3rd and 97th growth percentiles. Percentiles above 97% and below 3% are considered abnormal growth, but must be adapted to the growth process. The normal growth process is an upward trend and parallel to the high curve (12). Data were analyzed using SPSS software version 22 and Chi-square, One-way ANOVA and Bonferroni post hoc tests as well as logistic regression analysis and Pearson and Spearman correlation coefficient, while $p< 0.05$ was considered significant.

Results

The mean age of mothers in this study was 29.8±5.31 years. The minimum age was 19 and the maximum age was 46 years. Only 2 (1%) were divorced. 189 people (94.5%) lived in the city. 169 people (84.5%) were housewives and the rest were employees or were self-employed. Only 8 people (4%) had high income level, 47 people (23.5%) had low income and the rest were average. 99 people (46.5%) had one child and the rest had 2 or 3 children. 86 people (43%) had university education and the rest had high school diplomas and lower. All studied infants were 12 months old. Among the studied infants, 108 infants (54%) were boys and 92 infants (46%) were girls. All studied infants (100%) had an upward growth pattern in all three indices of weight, height and head circumference (Table 1). The mean score of maternal general health was 19.20±11.89 and the mean score under the depression component was 2.45±3.62 (Table 2).

In examining the relationship between mental health and growth indices, the results of univariate logistic regression showed that the prevalence of general health disorder of mothers whose children's height in the second month was in <3% and >97% percentiles, was 10.50 times (CI 95%: 1.03-22.16, and OR=10.50, and p=0.047), and in 3-15% percentile, was 7.00 times (CI 95%: 1.01-42.31, and OR=7.00, and p=0.048) more than other mothers and also the prevalence of general health disorder of mothers whose children's height in the fourth month was in 3-15% percentile, was 16.00 times (CI 95%: 1.23-24.91, and OR=16.00, and p=0.032) more than other mothers. In the study of trait anxiety, 71 (35.5%) had the minimum, 72 (36%) mild, 50 (25%) moderate and 7 (3.5%) had severe trait anxiety. In general health study, 139 patients (69.5%) were healthy and 58 patients (29%) had symptoms of mental disorder. In addition, 3 (1.5%) out of the 200 mothers were excluded from the study due to incomplete filling out of questionnaires. The correlation between GHQ-28 general health questionnaire and Spielberger trait anxiety was statistically significant (p<0.001 and r=0.723). In the study of state-trait anxiety scale using

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the scores of Spielberger questionnaire regarding infant weight at birth, a significant difference was observed between different growth percentiles at birth, which is related to the difference in growth percentiles of 15-50% and 50-85% (p=0.015). In the study of state-trait anxiety scale, no significant difference was observed in the index of weight in other studied months. In addition, in the evaluation of maternal trait anxiety scale regarding head circumference index of infants in the second month, a significant difference was observed between different growth percentiles, which is related to growth percentiles <3% and 3-15% (p=0.039) and also between growth percentiles 3-15% and 50-85% (p=0.033). There was no significant difference in maternal trait anxiety scores between the other variables. There was a significant difference in the evaluation of the mental health scale using the scores of the trait anxiety scale regarding the weight index between different percentiles at birth (p=0.012) and regarding the head circumference index in different percentiles of the second month (p=0.002) (Table 3). Significant differences were seen in the evaluation of mental health scale using the scores of GHQ-28 questionnaire regarding weight index in different percentiles at birth (p=0.030) and in head circumference index in different percentiles at the second month (p=0.027). There was no significant difference in infants' weight, height and head circumference indices in other months (Table 4). There was no significant difference in the quantitative and qualitative indices of infant growth in mothers of different ages. There were differences between different age groups of infants regarding quantitative and qualitative indices of infant's growth and mother's occupations. There was a difference in weight index in the twelfth month and mother's occupation between different growth percentiles (p=0.01). There was no statistically significant relationship between mother's occupation and birth weight in the second month, fourth month and sixth month. Height index in the twelfth month and mother's occupation had statistically significant difference between growth percentiles (p=0.039). There was no statistically significant relationship between mother's occupation and height at birth, in the second month, fourth month and sixth month. In the study of growth indices of weight and height, and education and income of mothers at birth, second month, fourth month, sixth month and the end of the first year, no statistically significant relationship was reported.

Table 1. Frequency of infant growth indices during the first year of life

Variable and growth percentile	At birth Number(%)	The second month Number(%)	The fourth month Number(%)	The sixth month Number(%)	Twelfth month Number(%)
Weight					
<3%	5(2.5)	3(1.5)	2(1)	0(0)	0(0)
3-15%	51(25.5)	51(25.5)	9(4.5)	7(3.5)	6(1)
15-50%	76(38)	76(38)	49(24.5)	41(20.5)	28(14)
50-85%	53(26.5)	53(26.5)	119(59.5)	127(63.5)	123(61.5)
85-97%	13(6.5)	13(6.5)	18(9)	21(10.5)	37(18.5)
>97%	2(1)	2(1)	3(1.5)	4(0)	6(3)
Height					
<3%	3(1.5)	3(1.5)	0(0)	0(0)	0(0)
3-15%	48(24)	48(24)	7(3.5)	4(0)	5(2.5)
15-50%	72(36)	72(36)	52(26)	35(17.5)	35(17.5)
50-85%	61(30.5)	61(30.5)	124(62)	130(65)	115(57.5)
85-97%	15(7.5)	15(7.5)	14(7)	27(13.5)	39(19.5)
>97%	1(0.5)	1(0.5)	3(1.5)	4(0)	6(0)
Head circumference					
<3%	3(1.5)	3(1.5)	0(0)	0(0)	0(0)
3-15%	48(24)	48(24)	5(2.5)	4(0)	5(2.5)
15-50%	78(39)	78(39)	59(29.5)	46(23)	38(19)
50-85%	62(31)	62(31)	120(60)	130(65)	123(61.5)
85-97%	9(4.5)	9(4.5)	15(7.5)	19(9.5)	32(16)
>97%	0 (0)	0(0)	1(0.5)	1(0.5)	0(0)

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Table 2. Scores of GHQ-28 mental health test and its subcomponents and Spielberger state-trait anxiety inventory in the studied mothers

Index	Mean±SD
Total score of general health	19.20±11.89
Somatization subcomponent	4.91±3.32
Anxiety subcomponent	5.58±4.18
Social dysfunction subcomponent	6.17±2.82
Depression subcomponent	2.45±3.62
Trait Anxiety score	39.51±9.12

*In each subcomponent, a score of 6 or higher indicates disease symptom.

Table 3. Evaluation of trait anxiety scale using Spielberger questionnaire scores in children's growth indices

Variable and growth percentile	Trait anxiety At birth Mean±SD	Second month Mean±SD	Forth month Mean±SD	Sixth month Mean±SD	Twelfth month Mean±SD
Weight					
<3% and >97%	43.29±14.77	39.00±14.72	45.60±7.64	40.75±7.14	39.67±11.34
3-15%	38.33±9.51	37.79±10.09	38.33±12.87	42.43±15.35	43.17±8.33
16-50%	41.80±8.77	39.91±9.25	41.16±8.16	38.37±9.26	42.96±8.78
51-85%	36.57±7.98	40.21±8.97	38.39±8.86	39.79±8.52	38.73±9.29
86-97%	40.69±7.19	36.96±8.00	41.33±10.92	38.86±10.73	38.86±8.29
P-value*	0.012**	0.598	0.175	0.802	0.192
Height					
<3% and >97%	40.75±14.06	42.60±12.86	40.00±6.56	41.75±6.40	40.50±9.97
3-15%	38.98±10.26	39.40±12.64	37.86±10.65	37.00±7.66	42.40±8.41
16-50%	39.15±8.62	40.16±8.98	41.08±10.43	38.06±8.54	41.06±9.09
51-85%	40.66±9.16	39.55±9.02	39.38±3.83	39.82±9.32	38.98±9.31
86-97%	37.93±6.47	35.81±6.61	35.57±4.85	39.93±9.73	39.15±8.81
P-value*	0.885	0.619	0.358	0.805	0.736
Head circumference					
<3% and >97%	42.67±23.12	47.25±15.09	32.00	32.00	0
3-15%	39.54±9.40	31.38±5.37	33.20±6.83	35.50±5.20	37.20±7.40
16-50%	39.90±8.84	37.96±7.91	38.58±9.41	40.24±9.67	39.13±8.88
51-85%	38.32±8.76	41.08±9.67	40.41±9.28	39.31±8.57	39.96±8.81
86-97%	43.11±7.22	38.89±7.55	38.60±6.45	40.37±12.13	39.22±10.88
P-value*	0.570	0.002**	0.289	0.744	0.876

*Using the One-way ANOVA test, **it is significant at the 0.05 level.

Table 4. Evaluation of mental health scale using GHQ-28 questionnaire scores in children's growth indices

Variable and growth percentile	Mental health At birth Mean±SD	Second month Mean±SD	Forth month Mean±SD	Sixth month Mean±SD	Twelfth month Mean±SD
Weight					
<3% and >97%	25.43±18.60	22.50±15.76	21.80±13.14	11.25±2.87	14.17±8.08
3-15%	17.14±10.58	16.29±12.52	17.67±15.72	26.43±17.81	21.17±15.32
16-50%	21.99±13.89	20.46±11.93	21.08±11.78	19.88±12.95	22.14±15.56
51-85%	16.38±7.89	19.08±12.17	18.44±11.51	19.17±11.30	18.49±11.13
86-97%	19.55±10.38	17.40±10.18	19.22±13.09	17.15±11.64	19.89±11.16
P-value*	0.030**	0.652	0.728	0.279	0.482
Height					
<3% and >97%	25.25±19.17	27.80±17.56	11.33±0.58	15.50±8.35	15.17±8.13
3-15%	18.32±12.18	23.70±17.13	22.57±11.39	21.25±4.35	17.40±18.20
16-50%	18.75±10.91	18.70±12.51	19.90±12.61	17.00±10.44	22.09±13.23
51-85%	20.62±13.06	19.39±11.10	19.64±12.04	20.22±12.74	19.37±12.13
86-97%	16.79±8.37	14.44±6.91	12.38±5.75	17.56±10.53	17.03±9.17
P-value*	0.592	0.150	0.165	0.537	0.396
Head circumference					
<3% and >97%	25.67±28.11	29.75±22.60	11.00±00	11.00±00	0
3-15%	17.09±9.73	18.50±7.17	18.60±6.27	20.00±6.27	14.20±2.28
16-50%	20.79±12.75	16.86±8.53	18.48±11.02	21.24±13.42	19.76±11.52
51-85%	19.18±11.89	21.27±13.87	19.88±12.84	18.10±11.13	19.36±12.08
86-97%	14.67±6.75	15.22±7.02	17.29±8.88	21.95±13.63	19.03±12.85
P-value*	0.297	0.027**	0.838	0.417	0.806

*Using the One-way ANOVA test, **it is significant at the 0.05 level.

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Discussion

The results of the present study showed that there is no relationship between maternal mental health and quantitative and qualitative characteristics in the growth process of infants at one year of age (weight, height and head circumference). Why this study did not find any relationship between maternal mental health and infants' growth indices is probably due to the fact that firstly, the mothers' scores on the scale of severe anxiety-trait and general health were in a very low level and very few mothers were diagnosed with mental health disorder. This raises the possibility that in this area, attention to the mother, especially during pregnancy, is relatively appropriate and care during and after pregnancy is done to the desired extent, and the support of families and even society for the mother is acceptable and desirable.

It seems that in this region, families provide mothers with psychological and nutritional support in order to have healthy children. Given the cultural conditions of our country and the importance of the foundation of the family, as well as the psychological support that is seen in Iranian families, especially during pregnancy and after that, this was not beyond expectations. The results of this research are in line with the results of Rahimi et al., Atrian et al., and Afshar et al. The results of these studies show that in the study of infant development, all biological and environmental aspects of children, mothers and other family members should be considered and the health of the mother should not be examined as the only important factor (13-15).

The results of a study conducted by Wemakor et al. in Ghana showed that maternal depression is highly prevalent in northern Ghana and is associated with the developmental status of children (7); difference with the present study can be due to differences in socio-cultural, religious, etc. matters. The results of this study were inconsistent with a study by Harpham et al. In their study, maternal mental health and children's nutritional status were correlated in four developing countries (16). Given the differences in the statistical population in terms of number as well as differences in geographical area, this difference is justifiable. On the other hand, the importance and effect of breastfeeding in the first year of life, especially exclusive breastfeeding in the first 6 months of life is undeniable in the development of the child (17, 18). In all Islamic sources, such as the Holy Qur'an, which is the most important and fundamental source and in fact the constitution of Islam, there is a clear and explicit emphasis and recommendation on the importance of breastfeeding (18).

In this study, there was no significant relationship between quantitative and qualitative indices of infant growth in the first year of life and maternal age. But in the Nankinga et al.'s study, children born to mothers aged 35-49 years were more likely to suffer from malnutrition compared to children born to younger mothers aged 15-24 years (19). This lack of consistency with the present study is understandable given the large number of the statistical population in this study, as well as the fact that children under 5 years of age (not just in the first year of life) were examined. One of the interesting points in the results of our study was the significant difference in weight and height index at the end of one year relative to the occupation of mothers. Among the growth percentiles of weight and height in the twelfth month, the majority of cases were related to housewives in the percentile of 50-85%. This is justifiable given that the majority of mothers studied were housewives and 100% of the studied infants had a normal growth pattern. Of course, the direct impact of a mother's occupation, regardless of her level of education, cannot be ignored. Normally, a working mother faces wider challenges in managing her baby care, especially in the first year of life.

In the study of Nankinga et al., the mother's occupation was also an important determinant of child malnutrition. Children whose mothers were engaged in farming and hard work were more likely to be malnourished than children whose mothers were engaged in formal/professional work (19). This result not only shows the importance of the impact of job but also it becomes clear that the type of mother's job is also one of the factors influencing the development of children (20, 21). The results of studies by Malik et al. and Ojobo et al. indicate that better educated mothers have better results in feeding their children and thus the growth of their infants compared to uneducated mothers (20, 22). But in our study, one of the criteria for inclusion was at least the fifth grade of primary education, and illiterate mothers were not included in the study. It is logical that the education level of high school diploma and higher is an acceptable level of knowledge to have the necessary information in the field of child nutrition status.

The results of Black et al.'s study showed that children of mothers with depressive symptoms have linear growth disorders (23). In this study, the correlation between two general health questionnaires of Goldberg General Health Questionnaire (GHQ-28) and Spielberger State-Trait Anxiety Inventory was statistically significant. The correlation obtained

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between these two questionnaires in this study also adds to the validity of this study and allows us to compare the growth indices of infants with the mental health of the mother not only at the end of one year, but also during the year. As mentioned, all studied infants had a normal growth pattern. Even in children whose birth percentiles were below 3% or above 97% at birth or at other times, they continued to grow normally. This emphasizes the importance of paying attention to growth process compared to evaluating growth over a period of time. Madlala et al. in a review article showed that maternal depression has an effective role in the process of feeding and growth of their infants, which in this study covers both pregnancy and postpartum period (24). The results of this study showed that there is a relationship between maternal mental health and birth weight. However, in the process of growth, there is no connection between growth indices and mental health. One of the limitations of this study was evaluating the mental health of mothers at the 12 months age of their child, so it is recommended that a study frequently assess maternal health during the development of the child in infancy and during pregnancy and evaluate its impact on development in addition to his/her growth.

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