

## Prediction of Child Development based on Social Determinants of Health: A Path Analysis

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### Abstract

**Background:** Many factors can effect on children's abilities and development. This study was conducted to investigate the effect of some risk factors as maternal health on child development using path analysis.

**Materials and Methods:** This cross-sectional study was conducted on a total number of 608 mothers and their children, multistage sampling method, in the city of Yasouj, Iran. The data collection instrument was questionnaire-based. The researcher-made questionnaire included a demographic characteristics information form for mothers and a child profile form. Other questionnaires included Ages and Stages Questionnaire (ASQ), Socioeconomic Inventory, Social Support Appraisals (SS-A) scale, Perceived Stress Questionnaire (PSS-14), Perceived Stress Scale (14 items), State-Trait Anxiety Inventory (STAI), Beck Depression Inventory (BDI-II), and Enrich Marital Satisfaction Scale. Mothers completed the questionnaires in 4 days and after that handed them over to the researcher in the kindergartens. To analyze the data, the SPSS software version 20.0 and LISREL 8.8 and path analysis test were used.

**Results:** Amount of developmental delay was 17.4% and the minimum and maximum delays were reported in problem-solving, personal-social skills and communication domains. There was a significant correlation between developmental status of children and socio-economic status, depression, social support, anxiety and marital satisfaction but correlation between developmental status of children and perceived stress was not significant. The final path model fitted well (RMSEA= 0.018, CFI= 1, NFI=1, IFI=1). Maternal anxiety had the most significant effect on child development ( $\beta_{\text{Total}} = -0.24722$ ).

**Conclusion:** Many factors including socio-economic status, maternal anxiety, perceived stress, social support, anxiety, and depression can affect on the developmental status of 3 to 5 year-old children.

**Key Words:** Developmental delay, Child development, Health, Mothers, Path analysis.

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## 1- INTRODUCTION

Children's health is of the utmost importance for future health status in a country; therefore, investing in their health can lead to valuable consequences in terms of the future health status of a nation (1). In this regard, early childhood plays a key role in human development since experiences obtained in this period can shape the entire life of individuals and their society. Development has been considered as a process of changes that directs children towards higher levels of completeness in terms of motor activities, process of thinking, feelings and emotions, as well as interactions with others and environmental factors (2,3).

Development generally occurs in five domains including fine motor activities, gross motor activities, problem solving, communication, and personal-social skills (4). If children do not earn developmental capabilities in accordance with their age, they might suffer from developmental delay or disorders (5). In this respect, it has also been reported that 8% of children are affected with developmental disorders in one or more domains from birth to 6 years of age (6). For example, the prevalence rate of developmental delay in children aged 4-60 months in the city of Tehran, Iran, had been reported 18% and this value was 16.2% in children aged less than 5 years (7, 8).

Primary life environment can have a vital effect on the process of the development of the brain in children, which can have an effect on children's abilities (9). There is currently strong scientific evidence that social determinants of health (SDH) including social class, social deprivation, living in slum areas, stress, child development, unemployment, working environment conditions, social support, addiction, nutrition, transportation, urbanization, migration, and globalization can have significant impacts on health status (10). To eliminate the causes of

health inequalities, relationships between SDH and their effects on health need to be identified (11). Additionally, numerous studies have confirmed the effect of socioeconomic factors, as predictors, on child development (8, 12). Accordingly, low socioeconomic status can reduce children's access to sufficient experiences and cognitive stimuli (13). Several studies have also investigated the effects of mediating social determinants, it has been suggested that maternal mental problems can have effects on quality and quantity of childcare, so lack of maternal attention to the issues inducing learning in children can lead to severe irritability among them and result in learning and behavioral problems (14-16). Thus, children of mothers experiencing anxiety can suffer from higher levels of cognitive, social, emotional, and behavioral problems (17).

Factors such as marital dissatisfaction and quality of communications between parents had an impact on children's health status (18, 19). Moreover, studies have similarly suggested that mother-child health status is directly related to social support in a way that increased support from parents has been advocated in various investigations due to better and considerably more effect of interventions on child development (20). Since SDH with their profound impacts on fetal and childhood health status play an important role in child development. The World Health Organization (WHO) reported that child development is one of the principal themes of SDH. Based on the WHO conceptual framework, structural factors, including socioeconomic status, affect biological, psychological, and behavioral factors, which influence the quality of health status and determine health inequalities (3). Due to the importance of child development and the significant prevalence of developmental delays and the need to identify risk factors for this problem in any society, a limited number

of studies have considered several risk factors, especially economic and social risk factors. Therefore, this study was considered. Moreover, it is not clear whether the development of children occurs due to the interference of multiple effective paths and their cumulative effect and overlap, or due to the independent effect of each path. On the other hand, "path analysis" is an appropriate statistical method in studies to investigate children's development. This study aimed to determine the effect of SDH on child development in the city of Yasouj, Iran, in 2018.

## 2- MATERIALS AND METHODS

### 2-1. Study design and population

This cross-sectional study was conducted on a total number of 608 mothers and their 3-5 year-old children in Kindergartens located in the city of Yasouj, Iran. The number of the participants was estimated by 546 individuals based on the 18% prevalence rate of developmental delay according to the study by Shahshahani et al. (7), and finally 608 samples were collected according to the following formula.

$$n \geq \frac{z_{1-\alpha/2}^2 (1-P)}{\varepsilon^2 P}$$

$$\begin{aligned} \alpha &= 0.05 \implies Z_{1-\alpha/2} = 1.96 \\ P &= 0.17 \\ \varepsilon &= 0.15 \end{aligned}$$

In this formula,  $\alpha$  was standard error of probability estimate,  $P$  proportion estimate in society, and  $\varepsilon$  estimated error limit. Multistage sampling method was also used in which the first stage was stratified sampling, so that the city of Yasouj was classified into three strata. Then, proportional to the number of Kindergartens in each stratum, they were selected using simple random sampling method, and the number of Kindergartens

(clusters) was selected via simple random sampling method. Finally, convenience-sampling method was performed in each Kindergarten according to the inclusion criteria.

### 2-3. Measuring tools

The data collection instrument was questionnaire-based. The researcher-made questionnaire included a demographic characteristics information form for mothers and a child profile form. Other questionnaires included Ages and Stages Questionnaire (ASQ), Socioeconomic Inventory (Garmaroudi et al., 2010), Social Support Appraisals (SS-A) scale (Vaux et al., 1977), Perceived Stress Questionnaire (PSS-14), Perceived Stress Scale (14 items) (Cohen et al, 1983), State-Trait Anxiety Inventory (STAI), Beck Depression Inventory (BDI-II), and ENRICH (Evaluation and Nurturing Relationship Issues, Communication, and Happiness) Marital Satisfaction Scale.

The Socioeconomic Inventory was designed based on that developed by Garmaroudi et al. (2010). In this questionnaire, the total score of 48 obtained the correlation of the given factors. Using factor analysis, the standard total score was calculated via summary index for all participants and its agreement with normal score was examined through Cohen's kappa coefficient = 0.87 (21).

STAI included individual self-assessment scales to measure state and trait anxiety, the total score of all the 20 items was calculated for each scale to obtain individuals' scores in each of the two scales. Therefore, scores for each state-trait anxiety scale could be at a 20-80 range (22). In Iran, the reliability of this research instrument has been obtained in different studies as 0.91, 0.95, and 0.90 (14, 22).

The Beck Depression Inventory (BDI-II), included 21 items related to various symptoms. The participants were required

to answer the items on a four-point Likert-type scale from zero to 3. This scale could measure varying degrees of depression with a score range from zero to 63. The reliability was reported 0.85 in the study by Sajedi et al. (14).

PSS-14 containing 14 items was used to measure perceived general stress in the last one month. The scores obtained from the PSS-14 were 0 and 56, respectively (23). The psychometric properties of this questionnaire have been determined for Iranian populations and its internal consistency was reported in studies as 0.86 and 0.90, respectively (14).

The Social Support Scale consisted of 23 items measuring availability, adequacy of belonging, and social cohesion. The scale showed to what extent a person believed that they had received the attention and respect of others encompassing three subscales of family (8 items), friends (7 items), and others (8 items) (24). The reliability of this questionnaire was reported 0.83 (25).

The ENRICH Marital Satisfaction Scale, employed to measure overall status of marital relationships, included 35 items and four subscales using a five-point Likert-type scale. This questionnaire could distinguish happy or unhappy couples by 85-95% accuracy (26, 27).

The Persian version of the ASQ was also used in this study to determine developmental performance. This questionnaire consisted of 30 items in 5 domains of communication, gross motor skills, fine motor skills, problem-solving, and personal-social skills. After completing the questionnaire, a comparison and interpretation was used to examine developmental status based on the cut-off points. This questionnaire has been normalized for Iranian children with Cronbach's alpha coefficient of 0.86 and its reliability reported as 0.93 (28). The reliability was reported as 0.83 by Sajedi et al. using the test-retest method (29).

## 2.4-Ethical consideration

The Center for Midwifery and Reproductive Health funded this research project. This study was the result of a research project fulfilled at the Center for Midwifery and Reproductive Health of Shahid Beheshti University of Medical Sciences. We hereby express our thanks to all those who contributed to this study. This study received an approval from the ethics committee with no. IR.SBMU.PHNM.1396.797. The participants were provided with details about research objectives, ensured about data confidentiality, and asked to sign an informed consent form.

## 2-5. Inclusion and exclusion criteria

The inclusion criteria in this study were Iranian mothers, having children aged 3-5 years, who had not divorced or were not on the verge of separation. They had also not experienced stress or any serious and important events like death in the last 6 months. Moreover, their children have not experienced any developmental disorders.

## 2-6. Data Analyses

Considering the conceptual framework background in this study, the relationship between SDH and child development was investigated (**Figure. 1**). Moreover, path analysis as a technique to examine a fit model that shows direct, indirect, and all observed effects and relationships of each variable on a dependent one was employed.

The two ways in which a predictor variable may affect a dependent variable in a path analysis include the following:

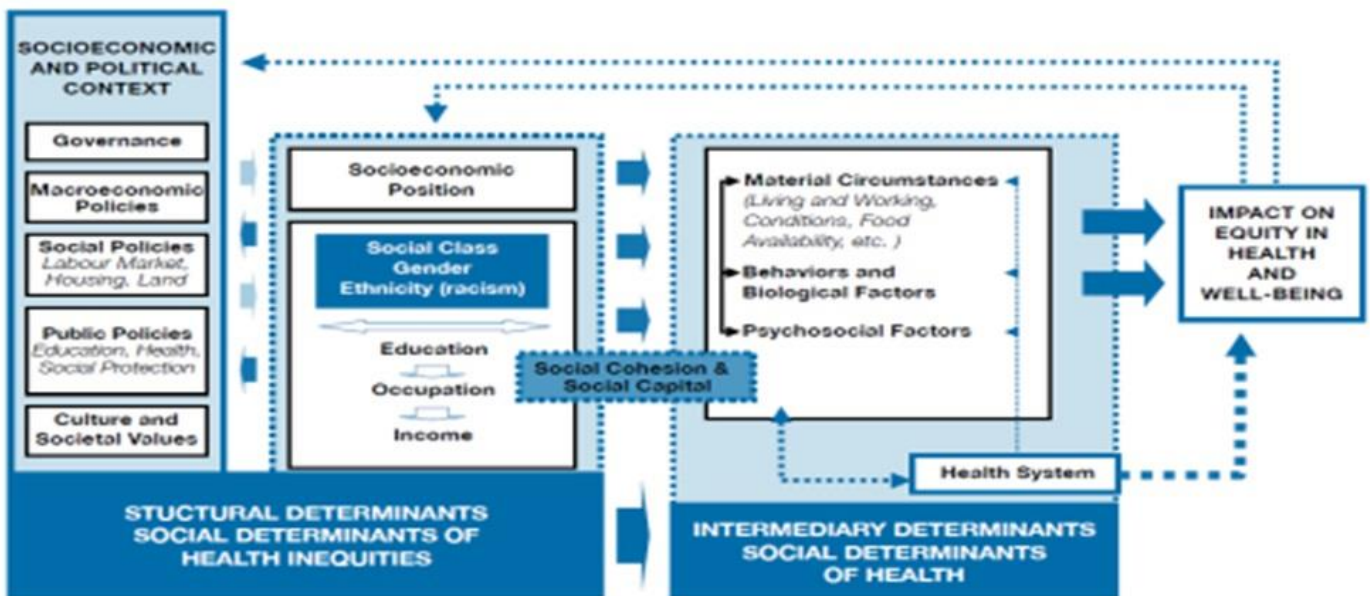
1. Direct effect: Indicates a direct effect of the variable X on the variable Y.
2. Indirect effect: An indirect effect of the variable X on Y is through another predictive variable. The relationship between X and Y is indirect when X is the cause of Z and Z in turn affects Y.

Many researchers tend to calculate the overall effect of one variable on another variable. This is achieved by summing the direct effects with the sum of its indirect effects. Indirect effects are calculated by multiplying the coefficients of each path, which includes the following:

1. Spurious effect: The relationship between X and Y is Spurious when Z is the cause of both the X and Y variables.
2. Non-analyzed effects: The relationship between the two variables is not analyzed when both of them are exogenous and therefore it is not possible to explain the variability between them by the model (30).

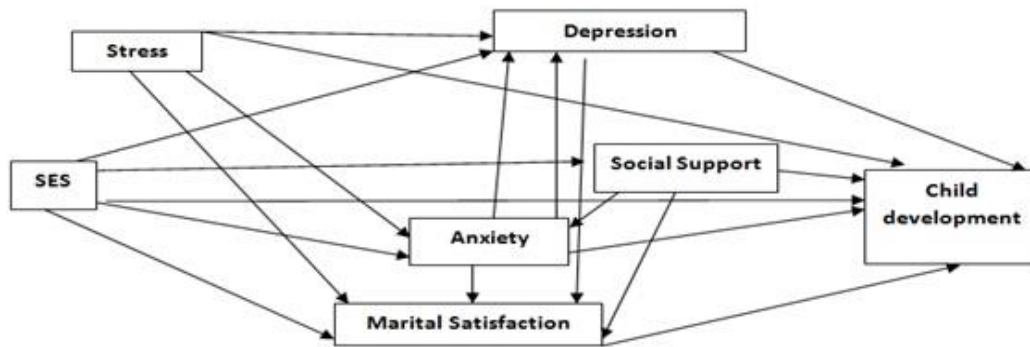
Within the path analysis, a number of indicators are also used to evaluate the fit

in which the ratio of Chi-square to degree of freedom ( $\chi^2/df$ ) with an acceptable amount of less than 3 (some have considered 4 and 5 as acceptable values) is one of the indicators. Other indicators are NFI (Normed Fit Index), CFI (Comparative Fit Index), and GFI (Goodness Fit Index) with values over 0.9 and RMSEA (Root Mean Square Error of Approximation) with values  $\leq 0.05$  and SRMSR (Standardized Root Mean Square Residual) with  $< 0.08$  acceptable fit (30-32). For analysis, SPSS software (version 20), and LISREL (version 8.8) were used. Based on the conceptual framework released by the WHO and a review of the related texts (3), the following model was proposed (**Figure. 2**).



**Fig.1:** Form of the SDH conceptual framework, SDH, WHO, 2010.

SDH: Social determinants of health.



**Fig.2:** Theoretical Path Model for Effects of Social Determinants of Maternal Health on Child Development (3).

**3- RESULTS**

This study aimed to investigate the relationship between SDH and developmental status of children aged 3-5 years and 608 pairs of mothers and children participated. The mean age of mothers in both natural development and developmental delay groups was 30.44 (5.33), and 30.06 (5.51) years old; respectively. Also, the mean age of fathers in both groups was respectively reported as 35.51 (6.1), and 34.51 (5.2) years. No significant relationship was observed

between natural development and developmental delay groups ( $p=0.743$ ). The mean maternal education in both groups was 10.58 (3.8) and 9.61 (4.45) years, respectively, and there was a significant relationship between maternal education in both study groups ( $p=0.04$ ). In total, 52.1% ( $n=317$ ) of the study samples were girls, and 14.8% ( $n=47$ ) of the girls and 20.3% ( $n=59$ ) of the boys were suffering from developmental delay. No significant difference was reported between gender and developmental status ( $p=0.0.7$ ). Developmental delay in all study samples was illustrated in (**Table. 1**).

**Table-1:** Developmental Status of 3-5 years old children ( $n=608$ ).

Child's Age (years)	Delayed Development (n=106)	Normal Development (n=502)	Total
	Frequency (%)	Frequency (%)	
3	21(18.1)	95(81.9)	116(100)
3.5	25( 22.3 )	87( 77.4 )	112(100)
4	18(13.8)	112(86.2)	130(100)
4.5	18(14.4)	107(85.6)	125(100)
5	24(19.2)	101(80.8)	125(100)
Total	106(17.4)	502(82.6)	608(100)

The total amount of developmental delay was 17.4%, and the also the amount was reported in problem-solving, personal-social skills, and communication domains, respectively (**Table. 2**). Additionally, 41.3% (n=251) of the mothers had a degree of depression, i.e. mild depression (24.3%, n=148) and severe depression (1%, n=6). As well, 46.5% (n=183) of them had high and very high marital

satisfaction and 35.2% (n=214) of these mothers had moderate marital satisfaction. Besides, 88.2% (n=536) of the mothers had moderate anxiety and 78.6% (n=478) of them had a favorable socioeconomic status. The mean level of stress in mothers in general was equal to 28.31 (6.7). The mean of developmental status of children and SDH were presented in (**Table. 3**).

**Table-2:** Developmental Status in 5 domains of 3-5year-old children (n=608).

Development of Domains	Delayed Development (n=106)	Normal Development (n=502)	Total
	Frequency (%)	Frequency (%)	
Gross motor	575(94.6)	33(5.4)	n=608
Fine motor	575(94.6)	33(5.4)	
Personal-social	577(94.9)	31(5.1)	
Communication	554(91.9)	54(8.9)	
Problem-solving	577(94.9)	31(5.1)	

**Table-3:** Mean scores of some determinants of maternal health and child development scores.

Variables	Mean	SD	Maximum Value	Minimum Value
Socio-Economic Status	20.56	5.53	44	8
Maternal Anxiety	44.55	9.13	71	20
Maternal Perceived Stress	28.32	6.72	53	8
Marital Satisfaction	112.50	13.75	175	35
Maternal Depression	9.9951	9.67810	50	0
Maternal Social Support	9.67810	3.18533	23	4
Child ASQ Score	244.94	46.70	300	40

ASQ: Ages and Stages Questionnaire, SD: Standard deviation.

Correlation between developmental status of children and SDH in mothers was illustrated in (Table. 4). In the path analysis, the socio-economic status had directly and indirectly affected child development. Moreover, depression had influenced child development in a direct manner. Perceived stress, social support,

and anxiety also affected child development directly and indirectly. Comparing the overall effects, maternal anxiety had the most significant effect on child development (Table. 5). Fitting the model using the indicators showed that the given model benefitted from good fit (Figure. 3 and Table. 6).

**Table-4:** Correlation among social determinants with child development.

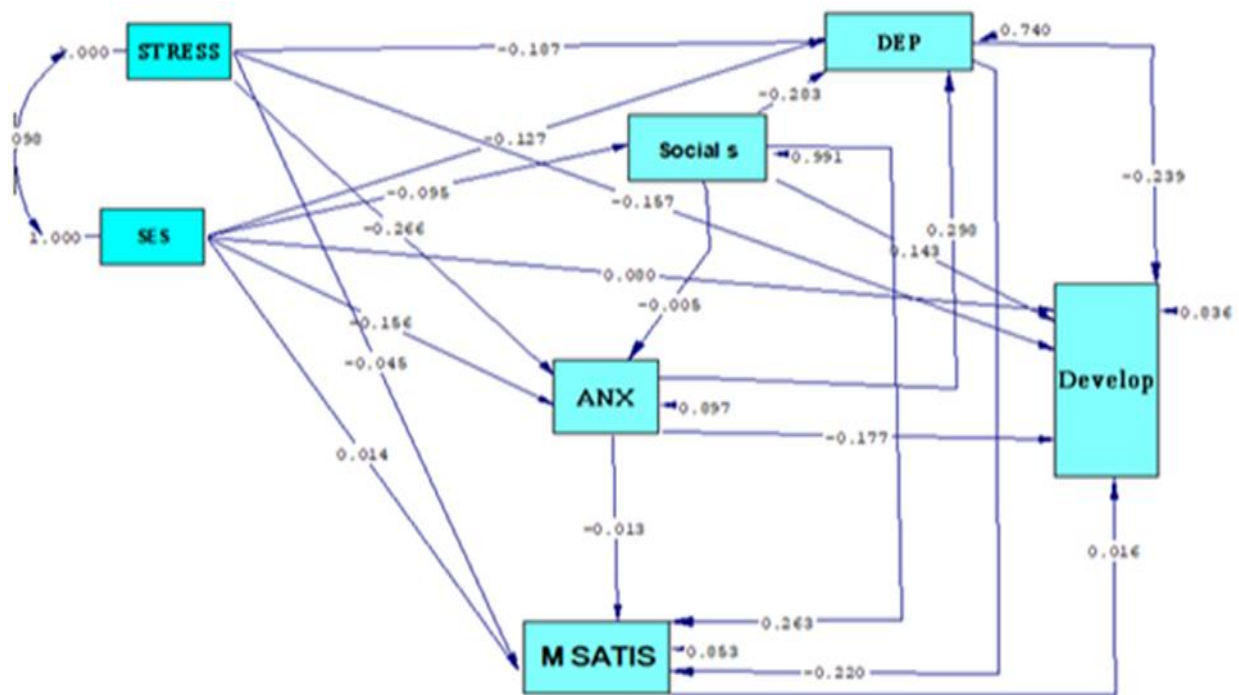
Variables		Depression	Perceive social support	Stress	Socioeconomic	Development	Anxiety	Marital satisfaction
Depression	Pearson Correlation	1	-.255**	-.269**	-.173**	-.316**	.368**	-.282**
	Sig. (2-tailed)		.000	.000	.000	.000	.000	.000
Perceive social support	Pearson Correlation		1	-.053	-.095*	.205**	.024	.320**
	Sig. (2-tailed)			.189	.019	.000	.548	.000
Stress	Pearson Correlation			1	.098*	-.043	-.281**	.005
	Sig. (2-tailed)				.015	.294	.000	.896
Socioeconomic (SES)	Pearson Correlation				1	.125**	-.182**	.025
	Sig. (2-tailed)					.002	.000	.532
Development	Pearson Correlation					1	-.233**	.144**
	Sig. (2-tailed)						.000	.000
Anxiety	Pearson Correlation						1	-.077
	Sig. (2-tailed)							.058
Marital satisfaction	Pearson Correlation							1
	Sig. (2-tailed)							

\*\* . Correlation is significant at the 0.01 level (2-tailed).  
 \* . Correlation is significant at the 0.05 level (2-tailed).

**Table-5:** Path Coefficients for social determinants of maternal health and child development.

Predictor variables	Effects			T-value
	Direct	Indirect	Total	
Socioeconomic	0.080	0.04957	0.11957	2.09
Depression	-0.239	-	-0.239	-5.43
Perceive social Support	0.143	0.06763	0.21063	3.52
Stress	-0.157	0.091775	-0.06522	-3.96
Anxiety	-0.177	-0.07122	-0.24722	-4.27





**Fig 3:** Full empirical path model for the effects of Social Determinants of Maternal Health on Child Development.

(SES: Socio-economic; DEP: Depression; ANX: Anxiety; SOCIAL S: Perceive social support; M SATIS: Marital satisfaction; Develop: Child development).

**Table-6:** Goodness of Fit Indices for the Model.

Fit Index	$\chi^2$	DF	P-value	NFI	CFI	IFI	NNFI	RMSEA
Model Index	1.20	1	0.27	1	1	1	0.99	0.018

X2: Chi-square test; DF: Degrees of freedom; NFI: Normed Fit Index; CFI: Comparative Fit Index; IFI: Incremental Fit Index; NNFI: Non-Normed Fit Index; RMSEA: Root Mean Square Error of Approximation.

#### 4- DISCUSSION

This study aimed to investigate the relationship between SDH and developmental status of children aged 3-5 years. The results have shown that many factors, including socio-economic status, maternal anxiety, perceived stress, social support, anxiety, and depression can effect on the developmental status of 3 to 5 years old children. In this study, path analysis was used to establish a relationship between theoretical and practical issues whose results showed that maternal

anxiety had the most significant effect on child development. Socioeconomic status (SES) had directly and indirectly influenced child development. Perceived stress, social support, and anxiety had also affected child development in a direct and indirect manner. In this respect, perceived depression had influenced child development directly. In this study, developmental delay in children was 17.4%. The most reported developmental delays were also in the domain of communication and the least ones were observed in the domain of motor activities.

In the study by Karami et al., developmental delay had been reported in 16.3% of one-year-old children (33). This slight difference could be due to sample sizes and children's age. Also, developmental delay was reported 16.2% in children aged 36-60 months old (8), and in children aged 4-24 months old in adolescent mothers, had been reported about 7% and the difference in the findings could be attributed to the age group of mothers (adolescents), and sample sizes (34). SES has been recognized as one of the most important health risk factors (35).

According to related studies, children growing up in families with low SES had an increased risk in terms of cognitive, emotional and psychological health status (36). Low SES of families could negatively affect developmental domains especially communication (37). Moreover, a relationship was observed between SES and motor development and cognitive domains (38). The effects of poverty on early childhood development have been also confirmed and long-term outcomes of cognitive and linguistic domains in children have been reported more than socio-emotional ones (39). Moreover, the effects of SES during infancy have been correlated with cognitive development in children aged 5 years (40).

Linguistic deficits and lower vocabulary tests were reported in poor children aged 3-6 years (41). Learning environments for children have been similarly associated with low SES, so that children's cognitive skills and their developmental consequences can be affected (42). Moreover, the development of the brain can be modulated by the quality of the environment (43), since the brain develops quickly through production of neurogenesis, axon, dendrite, and synaptogenesis, cell death, synaptic pruning, myelination, and glycogenesis (44). Thus, SES can influence neural development through different types of

mediators including nutrition, stress, parental factors, cognitive stimuli, etc. (45). In addition, lower SES is a barrier to access learning and cognitive stimuli. Besides, poverty is associated with a lack of food and limited health standards, low education, high maternal depression and stress and experiencing higher levels of environmental and psychological stressors (46). Moreover, children with lower SES, like children born into poor families are more likely to be exposed to conditions in conflict with development including living in crowded neighborhoods and slum areas with unhealthy individuals (47).

Findings of the present study confirmed the indirect effect of SES on child development through maternal psychological factors (depression and anxiety). As reported in related literature, parents with lower SES had an increased risk for a variety of psychological distresses such as negative feelings about self-worth and symptoms of depression (48). Accordingly, depression can overcome mother-child interactions and reduce developmental outcomes in social and cognitive domains (49).

Also, it was reported that SES was associated with chronic stress resulting in psychological disturbances and problems that could affect general health status in an individual (50). In the present study, the direct effect of maternal depression, anxiety, and stress on child development were confirmed, and it was also reported that depression had the most significant indirect effect. Studies have shown parental depression especially in mothers can be associated with developmental abnormalities in children (51). Children of mothers suffering from depression were more likely exposed to depression, suffer poor academic performance, as well as poor linguistic, communicative, and emotional skills (52). Also, major depression in mothers could have a negative impact on interactions and

attachment (53). In the given model, stress could also influence child development through the mediating effects of depression and anxiety. Reduced maternal responsibilities were observed in low-income families because of increasing maternal stress as a mediator (54). Moreover, anxiety could affect child development both directly and through the mediating effect of depression. It should be noted that it had the most significant effect in this domain. Studies have also reported a relationship between social support, mother-child health status, and depression so that mothers receiving more social support can easily assume maternal responsibilities and relationships with their children (55, 56). The children of anxious mothers have troubles in terms of communicating with friends and playing (57). The findings of this study showed that social support could directly and indirectly affect child development through the mediating effect of maternal depression. The results of studies also revealed that social support could have a protective effect against depression.

Social support has been observed in all aspects of health and well-being (58), and studies have demonstrated a relationship between mother-child health status and social support (59). To determine the impact of social support on health status, two processes have been considered; the direct impact of social support on health and the moderating effect that social support has a determining role as a barrier against depression in order to cope with stress (60, 61). The relationship between depression and its impact on child development has also been confirmed (14). The findings of the present study were consistent with the results of previous investigations (61, 14), and showed the effect of maternal social support through maternal depression and its indirect impact on child development. Among the strengths of this study was simultaneous

examination of factors influencing development by means of a statistical model as well as use of valid and reliable instruments and methods. One of the limitations was ignoring the role of father; in addition, this study was carried out on children of nursery schools, so it can only be generalized to such centers.

## 5- CONCLUSION

In this study, the proposed model concerning the impact of SDH on child development was acceptable. The greatest total effects on child development were also associated with maternal anxiety and social support. In the case of direct effects, maternal depression and anxiety had the most significant impacts, respectively. Designing a structural and mediating model for child development with a view towards SDH was done in the present study. The results of the present study showed that the given model was not significantly different from the conceptual framework that was designed based on the literature review

## 6- AUTHORS' CONTRIBUTION

Mahbobeh Ahmadi Doulabi: Study concept and design, development of original idea, data collection, statistical analysis, and writing the manuscript.

Noursadat Kariman: Study concept and writing the manuscript.

Sepideh Hajian: Development of original idea.

Zohreh Keshavarz: Study concept.

Fahimeh Rashidi Fakari: Study concept, Translation.

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**8- CONFLICT OF INTEREST:** None.

### 9- REFERENCES

1. Marmot M, Wilkinson R. Social Determinants of Health Oxford University Press: New York, USA; 2006.
2. Shonkoff JP, Richter L, van der Gaag J, Bhutta ZA. An integrated scientific framework for child survival and early childhood development. *Pediatrics*. 2012;129(2): e460-72.
3. Irwin LG, Siddiqi A, Hertzman C. Early Child Development: A Powerful Equalizer. Final Report for the World Health Organization's Commission on the social determinants of health. Available at: <http://apps.who.int/iris/bitstream/10665/69729/1/a91213.pdf>. Accessed: April 9, 2016.
4. Marcdante K, Kliegman RM. Nelson Essentials of Pediatrics E-Book: With STUDENT CONSULT Online Access. Elsevier Health Sciences; 2014 Feb 25.
5. Baker RC, editor. Pediatric primary care: well-child care. Lippincott Williams and Wilkins; 2001.
6. Tervo RC. Identifying patterns of developmental delays can help diagnose neurodevelopmental disorders. *Clinical pediatrics*. 2006; 45(6):509-17.
7. Shahshahani S VR, Azari N, Sajedi F, & A., K. (2011). Developmental screening for children 60-4 months in Tehran using the Denver Developmental Screening Test 2 and Ages and Stages Questionnaires. *Quarterly Journal of Rehabilitation*. 2011; 65-71 (3):12.
8. Doulabi MA, Sajedi F, Vameghi R, Mazaheri MA, Baghban AA. Socioeconomic status index to interpret inequalities in child development. *Iranian journal of child neurology*. 2017; 11(2):13.
9. Rahman A, Iqbal Z, Roberts C, Husain N. Cluster randomized trial of a parent-based intervention to support early development of children in a low-income country. *Child: care, health and development*. 2009;35(1):56-62.
10. Marmot M, Wilkinson RG, editors. Social determinants of health: the solid facts. Copenhagen: World Health Organization; 2003.
11. AS R. Cultural context and a critical approach to eliminating health disparities. *Ethnicity & disease*. 2010; 20: 71.
12. de Moura DR, Costa JC, Santos IS, Barros AJ, Matijasevich A, Halpern R, Dumith S, Karam S, Barros FC. Risk factors for suspected developmental delay at age 2 years in a Brazilian birth cohort. *Paediatric and perinatal epidemiology*. 2010; 24(3): 211-21.
13. Bradley RH, Corwyn RF. Socioeconomic status and child development. *Annual review of psychology*. 2002; 53(1):371-99.
14. Sajedi F, Doulabi MA, Vameghi R, Mazaheri MA, Akbarzadehbaghban A. Relationship of mothers' psychological status with development of kindergarten children. *Iranian journal of child neurology*. 2016; 10(3): 61.
15. Berg- Nielsen TS, Vika A, Dahl AA. When adolescents disagree with their mothers: CBCL- YSR discrepancies related to maternal depression and adolescent self-esteem. *Child: Care, Health and Development*. 2003; 29(3):207-13.
16. Propper C, Rigg J. Socio-economic status and child behaviour: evidence from a contemporary UK cohort. LSE STICERD Research Paper No CASE .2007.125
17. McLearn KT, Minkovitz CS, Strobino DM, Marks E, Hou W. The timing of maternal depressive symptoms and mothers' parenting practices with young children: implications for pediatric practice. *Pediatrics*. 2006; 118: e174-e182. doi: 10.1542/peds.2005-1551
18. Grych JH, Fincham FD. Marital conflict and children's adjustment: A cognitive-contextual framework. *Psychological bulletin*. 1990; 108(2):267.
19. Harold GT, Aitken JJ, Shelton KH. Inter-parental conflict and children's academic attainment: A longitudinal analysis. *Journal of child psychology and psychiatry*. 2007 ;48(12):1223-32.
20. Kingston D, Tough S, Whitfield H. Prenatal and postpartum maternal

psychological distress and infant development: a systematic review. *Child Psychiatry & Human Development*. 2012;43(5):683-714.

21. Garmaroudi G, Moradi A. Instrument designed to measure socioeconomic status in Tehran. *Payesh*. 2010; 2(9):137-44.

22. Bech P, Gormsen L, Loldrup D, Lunde M. The clinical effect of clomipramine in chronic idiopathic pain disorder revisited using the Spielberger State Anxiety Symptom Scale (SSASS) as outcome scale. *J Affect Disord* 2009; 119(1):43-51.

23. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. *J Health Soc Behav* 1983;385-96.

24. Alan, V., Jeffrey, Ph., Lori, H., Brian, T., Deirdre, W., & Doreen, S. The Social Support Appraisals (SS-A) scale: Studies of reliability and validity. *American Journal of Community Psychology*, 1986.14(2): 195-218.

25. Maroufizadeh S, Zareiyan A, Sigari N. Reliability and validity of Persian version of perceived stress scale (PSS-10) in adults. *Arch Iran Med*. 2014; 17(5):361-5.

26. Asoodeh MH, Daneshpour M, Khalili S, Lavasani MG, Shabani MA, Dadras I. Iranian successful family functioning: Communication. *Procedia-Social and Behavioral Sciences*. 2011; 30: 367-71.

27. Ghahremani F, Doulabi MA, Eslami M, Shekarriz-Foumani R. Correlation between number and gender composition of children and marital satisfaction in women presenting to health centers in Tehran-Iran, 2015. *Iranian Journal of Psychiatry and Behavioral Sciences*. 2017; 11(2): e9598.

28. Vameghi R, Sajedi F, Mojembari AK, Habiollahi A, Lornezhad HR, Delavar B. Cross-cultural adaptation, validation and standardization of Ages and Stages Questionnaire (ASQ) in Iranian children. *Iranian journal of public health*. 2013; 42(5):522.

29. Ahmadi Doulabi M, Sajedi F, Vameghi R, Mazaheri MA, Akbarzadeh Baghban A, Afraz F. Marital Satisfaction and Depression in Mothers of 3-4 Year Old Children with Developmental Delay in Comparison with

Mothers of Normal Children. *Iran J Child Neurol*. Autumn 2019; 13(4): 91-108.

30. Barbara Hazard Munro, *Statistical Methods for Health Care Research Fifth (5th) Edition*, lippincott williams & wilkins: Philadelphia, Baltimore, New York, 2005. Chapter 16.

31. Cooper, D, Coughlan, J and Mullen, M. *Structural Equation Modelling: Guidelines for Determining Model Fit*. *Electronic Journal of Business Research Methods*, 2008; 6(1): 53-60.

32. Marsh HW, Balla JR, McDonald RP. Goodness-of-fit indexes in confirmatory factor analysis: The effect of sample size. *Psychological bulletin*. 1988;103(3): 391.

33. Karami K, Abbasi L, Moridi F, Falah F, Bayat Z, Pourvakhshoori N. Evaluation criteria and factors associated with the development of one year old children in Khorramabad. *Iran J Pediatr* 2015; 1(3):57-64.

34. Afraz F, Ahmadi Doulabi M, Sajedi F, Akbarzadeh A, Rashidi Fakari F. Comparison of Developmental Status of Infants Less Than 24 Months Who Were Born from Mothers in High-Risk Age Groups. *Adv Nurs Midwifery*. 2019; 28(4):2026

35. Haghdoost AA. Complexity of the Socioeconomic Status and its Disparity as a Determinant of Health. *Int J Prev* 2012; 3(2):75.

36. de Onis M, Blössner M, Villar J. Levels and patterns of intrauterine growth retardation in developing countries. *European Journal of Clinical Nutrition*. 1998; 52:S5-15.

37. Paiva GSd, Lima ACVMd, Lima MdC, Eickmann SH. The effect of poverty on developmental screening scores among infants. *Sao Paulo Med J* 2010; 128(5):276-83.

38. Servili C, Medhin G, Hanlon C, Tomlinson M, Worku B, Baheretibeb Y, Dewey M, Alem A, Prince M. Maternal common mental disorders and infant development in Ethiopia: The P-MaMiE Birth Cohort. *BMC Public Health*. 2010;10(1):693.

39. Aber JL, Jones S, Cohen J. *The impact of poverty on the mental health and development of very young children*. 2nd ed. New York, NY, US: Guilford Press; 2000. p. 113- 128.

40. Sigman M, McDonald MA, Neumann C, Bwibo N. Prediction of cognitive competence in Kenyan children from toddler nutrition, family characteristics and abilities. *J Child Psychol Psychiatry* 1991; 32(2):307-20.
41. Paxson C, Schady N. Cognitive development among young children in Ecuador the roles of wealth, health, and parenting. *J Hum Resour* 2007; 42(1):49-84.
42. Feinstein L. Inequality in the early cognitive development of British children in the 1970 cohort. *Economica* 2003; 70(277):73-97.
43. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter L, Strupp B, et al. Developmental potential in the first 5 years for children in developing countries. *The lancet* 2007; 369(9555):60-70.
44. Thompson RA, Nelson CA. Developmental science and the media: Early brain development. *Am Psychol* 2001; 56(1):5.
45. Hackman DA, Farah MJ. Socioeconomic status and the developing brain. *Trends Cogn Sci* 2009; 13(2):65-73.
46. Bradley RH, Corwyn RF. Socioeconomic status and child development. *Annu Rev Psychol* 2002; 53(1):371-99.
47. DiPietro JA. Baby and the brain: Advances in child development. *Annu Rev Public Health* 2000; 21(1):455-71.
48. Jack S, Philips D. From neurons to neighborhoods: The science of early childhood development. National Academy Press Washington, DC; press; 2000.p.289.
49. Murray L, Cooper PJ. Effects of postnatal depression on infant development. *Arch Dis Child* 1997; 77(2):99-101.
50. Baum A, Garofalo JP, Yali AM. Socioeconomic status and chronic stress: does stress account for SES effects on health? *Annals of the New York academy of Sciences*. 1999; 896(1):131-44.
51. Ali NS, Mahmud S, Khan A, Ali BS. Impact of postpartum anxiety and depression on child's mental development from two peri-urban communities of Karachi, Pakistan: a quasi-experimental study. *BMC psychiatry*. 2013; 13(1):1.
52. Ordway MR. Depressed mothers as informants on child behavior: Methodological issues. *Res Nurs Health* 2011; 34(6):520-32.
53. Tomlinson, M., Cooper, P., & Murray, L. (2005). The Mother–Infant Relationship and Infant Attachment in a South African Peri- Urban Settlement. *Child development*, 76(5), 1044-54.
54. Evans GW, Boxhill L, Pinkava M. Poverty and maternal responsiveness: The role of maternal stress and social resources. *Int J Behav Dev* 2008; 32(3):232-7.
55. Logsdon CM, Birkimer JC, Ratterman A, Cahill K, Cahill N. Social support in pregnant and parenting adolescents: Research, critique, and recommendations. *Journal of Child and Adolescent Psychiatric Nursing* 2002; 15:75-83.
56. Miech RL, Shanahan MJ. Socio-economic status and depression over the life course. *Journal of health and social behavior*.2000; 41: 162-76.
57. Petrozzi A, Gagliardi L. Anxious and depressive components of Edinburgh Postnatal Depression Scale in maternal postpartum psychological problems1. *Journal of perinatal medicine*. 2013; 41(4):343-8.
58. Wang J, Mann F, Lloyd-Evans B, Ma R, Johnson S. Associations between loneliness and perceived social support and outcomes of mental health problems: a systematic review. *BMC psychiatry*. 2018; 18(1):156.
59. Logsdon MC, Birkimer JC, Ratterman A, Cahill K, Cahill N. Social support in pregnant and parenting adolescents: Research, critique, and recommendations. *Journal of Child and Adolescent Psychiatric Nursing*. 2002; 15(2):75-83.
60. Bishop SL, Richler J, Cain AC, Lord C. Predictors of perceived negative impact in mothers of children with autism spectrum disorder. *Am J Ment Retard*. 2007; 112(6): 450-61.
61. Paykel ES. Life events, social support and depression. *Acta Psychiatr Scand Suppl*. 1994; 377: 50-8.