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Relationship between having siblings and developmental status: A cross-sectional study in a cohort of 2-year-old Iranian children

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Abstract:

AIMS: Dealing with the aging population crisis is one of the priorities of research and intervention in Iran, which requires scientific and comprehensive persuasion of families to have more children. This study investigated the relationship between having siblings and child' developmental status.

METHODS AND MATERIALS: Using the data from the PERSIAN birth cohort study, 611 two-year-old children who were residents of Semnan were investigated. The studied information included the gender of the child, the number of siblings, and the developmental test score of the child at the age of two. The assessment of the child's development was performed using the Ages and Stages Questionnaires (ASQ).

RESULTS: Among 294 girls and 317 boys, 352 (57.6%) had no siblings, and the remaining group had between 1 and 5 siblings. The mean (± standard deviation) of the developmental score in children who had siblings (281 ± 23) was higher than children who did not have siblings (278 ± 21) (Cohen's d = .14, P = .029). This difference was also true in the field of large movements (P = .001). Adjusting for gender of child, age, and education of mother only the relationship between large movements and having siblings remains significant (P = .015).

CONCLUSIONS: Having siblings may help a child develop social and personal skills probably by increasing family social interaction. Emphasizing the positive impact of having brothers and sisters on a child's growth and development can be a motivating factor for having more children in the family.

Keywords:

ASQ questionnaire, birth cohort, developmental skills, siblings

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Introduction

Dealing with the aging population crisis is one of the priorities of research and intervention in Iran, which requires scientific and comprehensive persuasion of families to have more children. Having children is one of the important factors in population science, and it is one of the topics that is very important in the field of social and cultural issues. Demographic changes, especially the decrease in fertility in Iran, have led to many changes in the age structure of the population.[1]

The family unit holds a fundamental and significant role within the social framework of children's lives. Indeed, the establishment of a relationship within the family system during the early years of life serves as the bedrock for the process of socialization and significantly influences the developmental trajectory of children and adolescents. The existing body of literature pertaining to family relationships mostly centers around

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the attributes of mothers and dads in their roles as primary caregivers. This emphasis sheds light on the complexities inherent in parent-child relationships, as well as the distinct influence they exert on children's growth and adaptation.[2-4] The research has neglected to address the other subsystems present within the family environment.[5] In recent decades, scholars in the field of developmental psychology, along with academics in related disciplines, have increasingly focused their efforts on examining sibling relationships. This includes investigating the various dimensions and quality of these relationships, as well as exploring their specific effects on the social and psychological well-being of children.[6-8] In other words, interaction with an older sibling strengthens the verbal skills and cognitive development of the younger child. Also, having an older sibling helps the child to express his positive and negative feelings in a way that is accepted by society.[9] Currently, empirical evidence suggests that educational and caregiving encounters inherently facilitate cognitive, verbal, and psychosocial advancement in both older and younger siblings.[10,11] Older siblings become better teachers in childhood because they learn how to make chores easy for their younger siblings. Because older siblings gain the ability to consider others' views, their ability to alter their own educational behaviors grows in tandem with the capacities of their younger siblings.[12] A caring and conflicting sibling relationship can provide a unique chance for children to acquire the ability to understand the sentiments and viewpoints of others, learn to manage anger, settle conflict, and generate education for themselves.[13] Indeed, younger siblings who encounter a harmonious blend of nurturing and conflict within their sibling relationships exhibit greater social competence and establish more favorable peer interactions compared to children who are deprived of such encounters.[14-16] According to the current situation in Iran in terms of children's development and also considering the results of previous studies that show the effect of siblings on the cognitive, social, and emotional development of children, the purpose of this study is to investigate the relationship between having siblings and 2-year-old children' developmental status among the newborn babies in Semnan city. Regarding the importance of protecting the youth of the population, which is a research and intervention priority in Iranian society today, and the fact that population youth can be investigated from different dimensions, the present study was performed to investigate this issue from the point of view of the possible impact of having brother and sister on the conditions of growth and development of babies as an encouraging factor for having more children and increasing the size of the family. Of course, the search for sources in this regard did not confirm or deny the hypothesis of the existence of this type of relationship in Iranian society. Therefore, this analysis was performed.

Materials and Methods

Study design and setting

The present study was performed using the analysis of Semnan Birth Cohort data, a branch of PERSIAN birth cohort study, which is considered one of the most important Iranian multi-centric in process birth cohort studies. The PERSIAN (Prospective Epidemiological Research Studies of the Iranian Adults, Adolescents, and Newborns) birth cohort is designed as a multi-center network of population-based birth cohorts in areas representing cultural and contextual variations in Iran. The overarching aim of this project is to study developmental origins of health and diseases concept in the Iranian population. Toward this aim, the PERSIAN birth cohort will evaluate the impact of socioenvironmental, psychological and genetic factors on pregnancy outcomes, child mental and physical health, growth and development, and early- and late-onset chronic noncommunicable diseases.[17]

The present investigation is grounded in a cross-sectional analytical design. The population under study comprised all children aged 2 years whose 2-year questionnaires were completed between the years 2017 and 2022 in Semnan City.

Study participants and sampling

The sample studied were all children whose information was fully available through the Semnan Birth Cohort study archive. Following a thorough assessment of available data, the sample size was 611 individuals. Although the data are derived from a cohort study, the analysis in this article was performed on 2-year-old children cross-sectionally. Having full mothers' consent and having a healthy child were considered as the inclusion criteria in the study. Also, having twin children or more children, as well as the lack of complete information about the child in the system, were considered as the exclusion criteria of this study.

Data collection tool and technique

In this study, to collect information, the Ages and Stages Questionnaires (ASQ) were used as a global screening tool for growth and development, which monitors infants and toddlers from the age of 1 month to 66 months. This questionnaire includes five questions on problem-solving, communication, delicate motor skills, large motor skills, and personal-social behavior. This questionnaire was completed based on parents' observations and the maximum score for each area is equal to 60 and for the whole scale is equal to 300.[18]

Data analysis

Mean, standard deviation, median, and interquartile range were used to report numerical variables. The frequency distribution of categorical variables is

reported in terms of count and percentage. The data analysis was performed using Mann–Whitney U test, Pearson's correlation coefficient, and linear regression statistical models. To calculate the effect size, the Cohen D statistic for the *t*-test was used, and as suggested by Cohen, the effect sizes were interpreted as small (d = 0.2), medium (d = 0.5), and large (d = 0.8). Data analysis was conducted using statistical SPSS (version 24), and *P* value of less than 0.05 was considered significant.

Ethical considerations

This study was approved by the ethics committee of Semnan University of Medical Sciences (IR.SEMUMS.REC.1400.279). Access to the participants' information was performed with the permission of the vice president of research at the university. All aspects of confidentiality were observed in the study, and researchers were committed to keeping the participants' information confidential.

Results

Among the total of 1023 mothers registered in the study, after removing the mothers who had twins' delivery, they withdrew from the project, due to fetus abortion or infant death, or because they did not have complete information in the system, the data of 611 people were included in the study. The average age of mothers participating in this study was equal to 29.13 ± 4.97 years. The minimum age was 15 years, and the maximum age was 46 years; among these, 316 (57.1%) mothers were under 30 years old. The frequency distribution of the participants in terms of the education level of the mother, the gender of the baby, and the status of having siblings is shown in Table 1. As seen in Table 1, 244 participating mothers in this study (39.9%) had a bachelor's degree, and 77 people (12.9%) had a master's degree. In terms of the gender of the babies, 294 babies (48.1%) were girls, and 317 babies (51.9%) were boys. Among all, 259 babies (42.4%) had siblings, and the rest of them (352, 57.6%) had no siblings. The frequency distribution of the participants in terms of the number of siblings based on gender showed that 190 babies (31.1%) have only one sister or one brother. One hundred eighteen babies (19.3%) had only one brother, and 122 babies (20%) had only one sister [Table 1].

In the investigation of the developmental scores of the studied babies, it was found that the highest score acquired was in the field of delicate movements (58.5 ± 4.3), and the lowest score acquired in the field of social-personal area (53.8 ± 7.7). The comparison of scores between the two groups (with and without siblings) showed that babies with siblings had a higher average score total (281.3 ± 23.0 vs 278.4 ± 21.5, *P* = .029) and in the area of acquiring large movement skills (56.7 ± 6.6 vs 55.1 ± 8.1, *P* = .001) than babies without having siblings,

Table 1: The frequency distribution of mothers' age, baby's gender, education level of mothers and number of siblings in the participants (*n*=611)

Characteristics		Number	%
Mothers' age group	<30	316	51.7
	30 and higher	295	48.3
Education level of mothers	Illiterate	2	0.3
	Elementary School	11	1.8
	Basic reading and writing	1	0.2
	Middle School	34	5.6
	High School diploma	171	28.0
	Associate degree	65	10.6
	Bachelor's degree	244	39.9
	Master's degree	77	12.6
	PhD, GP, Dentist, Pharmacist	6	1.0
Babies gender	Girl	294	48.1
	Boy	317	51.9
Having sibling	No	352	57.6
	Yes	259	42.4
Number of brothers	0	465	76.1
	1	118	19.3
	2	23	3.8
	3	4	0.7
	5	1	0.2
Number of sisters	0	468	76.6
	1	122	20.0
	2	19	3.1
	3	1	0.2
	4	1	0.2
Number of siblings	0	352	57.6
	1	190	31.1
	2	55	9.0
	3	11	1.8
	5	3	0.5

which shows that there is a significant relationship at the significance level of *P* <0.05 with no adjusting marginally. Adjusting for gender of child, age, and education of mother only the relationship between large movements and having siblings remains significant (*P* = .015). In the topics related to communication, delicate movements, problem-solving and personal-social skills, no significant relationship was found between babies with siblings and babies without siblings [Table 2].

The analysis of the correlation between each of the areas in ASQ with the number of sisters, brothers, and siblings revealed that the babies who have more brothers (r = .098, *P* = .015) or more siblings (r = .129, *P* = .001), they could obtain significantly higher motor skills scores in terms of large movements. Also, in the acquisition of delicate motor skills, the correlation between having more brothers with obtain higher scores was positive and significant (r = .081, *P* = .045) [Table 3].

A comparison of the two groups in boys and girls separately also confirmed the existence of a relationship

Table 2: The comparison of ASQ-scores between two groups (with and without siblings) in each area in the participants (*n*=611)

Area	All children				Not having siblings				Having siblings				Effect size[a]	*P*[b]	*P*[c]
	Mean	SD	Median	IQR	Mean	SD	Median	IQR	Mean	SD	Median	IQR			
Communication	55.1	6.9	60	10	55.1	6.7	60	10	55.2	7.2	60	10	0.01	0.558	0.982
Large motion	55.8	7.5	60	10	55.1	8.0	60	10	56.7	6.6	60	5	0.22	0.001	0.015
Delicate motion	58.5	4.3	60	0	58.4	4.3	60	0	58.7	4.4	60	0	0.07	0.050	0.236
Problem solving	56.9	5.7	60	5	56.6	6.1	60	5	57.4	5.1	60	5	0.14	0.115	0.166
Personal-social	53.8	7.7	55	10	53.5	7.8	55	10	54.2	7.6	55	10	0.09	0.322	0.830
Test final	279.6	22.2	285	25	278.4	21.5	285	29	281.3	23.0	285	25	0.14	0.029	0.302

SD: Standard deviation, IQR: Interquartile range, [a]Cohen D for *t*-test, [b]Mann-Whitney *U* test (no adjusting), [c]Adjusted for age (year) and education of mother (1: lower than high school, 2: at the level of high school diploma and 3: university education) and gender of child using linear regression multiple model

Table 3: The correlation between each of ASQ areas with the number of sisters/brothers and the number of siblings in the participants (*n*=611)

Area	Spearman's correlation coefficient (*P*)		
	Number of brothers	Number of sisters	Number of siblings
Communication	-0.015 (.708)	0.004 913)	0.011 (.781)
Large motion	0.098 (.015)	0.061 (.134)	0.129 (.001)
Delicate motion	0.081 (.045)	0.008 (.845)	0.065 (.106)
Problem solving	0.003 (.934)	0.073 (.071)	0.050 (.216)
Personal-social	0.002 (.956)	0.065 (.107)	0.045 (.266)
Test final	0.027 (.498)	0.063 (.118)	0.078 (.054)

between having siblings and increasing the score of ASQ in term of acquiring large movement skills [Table 4].

The comparison of the two studied groups at different levels of mother's education and age group is shown in Table 5. As can be seen, in mothers with university education, having siblings is associated with a better score in general (P = .004) and in the areas of large movements (P < .001), delicate movements (.004), and problem-solving skill (P = .002). A comparison of the two groups in boys and girls separately also confirmed the existence of a relationship between having siblings and increasing the score of ASQ in terms of acquiring large movement skills. The comparison of children with and without having siblings in mothers in the two defined age groups (<30 and ≥30 years) showed the existence of the same relationship only in mothers with an age greater than or equal to 30 years.

Discussion

The present study sought to examine the impact of sibling presence on the cognitive, social, and emotional development of children. The main hypothesis in the present study was that having siblings can be related to the child's behavioral and skill development. This hypothesis originates from the fact that by increasing the possible interactions between the child and the younger members of the family accelerates and improves the acquisition of his skills. The results of the analysis conducted in the present study have confirmed a significant relationship with a small effect size between having siblings and the acquisition of gross motor skills in children studied at the age of two. In the same direction, a significant but weak positive correlation between the number of siblings and the child's gross motor skills acquisition score was also reported, which again supports the above hypothesis. It is necessary to remember that these children were all the last children of their parents, and therefore, if they were not the only and first child of their family, their brothers or sisters were older than them. Also, children who had twins were not included in the study so that its confounding effect on the results of the analysis would not cause error or bias.

In the ASQ questionnaire, questions related to the acquisition of gross movement skills are related to the child's ability to go up and down the stairs with the help of others and by leaning on the wall or fence consecutively without stopping, running correctly without hitting obstacles and stopping on time, jumping with both feet off the ground and the ability to shoot the ball without needing support. Many of these skills seem to be practiced in the form of play with a brother or sister. Also, the child tries to look at his older brother or sister, who probably spends more time with him at home, and perhaps imitates him to do his work similar to him. In a way, this means the child's practice and repetition in acquiring gross motor skills.

The study conducted by Yue *et al*. (2021)[19] examined the disparity in socio-emotional development scores between single children and children with older siblings. The findings of the study indicated that the presence of siblings had a detrimental impact on the social-emotional development of girls, while no significant relationship was observed for boys. In the study by Rodrigues *et al*.,[20] which was conducted in 2021, it was stated that having siblings is effective in the acquisition of motion skills of babies. Also, Krombholz *et al*.[21] stated that children with older siblings are more successful in the learning of large and delicate motor skills than children without siblings, which the results of our study confirmed the results of Krombholz and Rodrigues's study. These findings indicate that the presence of an additional child

Table 4: The comparison of developmental scores between children with or without siblings by gender of child in the participants (*n*=611)

Gender	Area	Not having siblings				Having siblings				*P**
		Mean	SD	Median	IQR	Mean	SD	Median	IQR	
Girls (*n*=294)	Communication	55.6	6.4	60	10	56.1	5.9	60	5	0.475
	Large motion	55.4	8.2	60	10	57.5	5.5	60	0	0.008
	Delicate motion	58.6	3.6	60	0	58.9	3.2	60	0	0.223
	Problem solving	56.7	5.9	60	5	57.7	4.3	60	5	0.287
	Personal-social	54.0	7.0	55	10	54.5	7.3	55	10	0.454
	Test final	280.2	19.1	285	25	284.6	15.3	290	20	0.074
Boys (*n*=317)	Communication	54.6	6.9	60	10	54.4	7.9	60	10	0.733
	Large motion	54.7	7.8	60	10	56.2	7.3	60	10	0.032
	Delicate motion	58.2	4.9	60	0	58.5	5.1	60	0	0.119
	Problem solving	56.4	6.3	60	5	57.2	5.7	60	5	0.248
	Personal-social	52.9	8.6	55	10	54.1	7.7	54	10	0.408
	Test final	276.5	23.7	280	30	278.8	27.2	285	30	0.141

*Mann-Whitney *U* Test

Table 5: The comparison of developmental scores between children with or without siblings by mothers' education level and age (*n*=611)

Mothers' education level and age		Area	Not having siblings				Having siblings				*P**
			Mean	SD	Median	IQR	Mean	SD	Median	IQR	
Education level	Up to high school (*n*=48)	Communication	54.2	9.7	60.0	12.5	55.6	5.6	60.0	10	0.802
		Large motion	56.3	4.8	60.0	10	56.5	6.6	60.0	5	0.530
		Delicate motion	58.8	3.1	60.0	0	58.6	3.7	60.0	0	0.877
		Problem solving	54.6	7.5	57.5	10	57.4	4.5	60.0	5	0.198
		Personal-social	52.5	6.2	52.5	7.5	54.6	6.7	55.0	7.5	0.186
		Test final	276.3	23.7	290.0	35	282.6	14.4	282.5	25	0.502
	High school diploma (*n*=171)	Communication	55.5	6.3	60.0	5	55.5	6.6	60.0	10	0.775
		Large motion	55.9	6.6	60.0	10	55.8	8.1	60.0	10	0.675
		Delicate motion	58.3	5.5	60.0	0	58.0	5.7	60.0	0	0.727
		Problem solving	57.4	5.6	60.0	0	56.5	5.5	60.0	5	0.075
		Personal-social	53.0	8.7	55.0	10	54.2	8.0	55.0	10	0.522
		Test final	280.0	22.2	290.0	35	278.7	26.8	285.0	20	0.671
	University (*n*=392)	Communication	55.0	6.6	60.0	10	54.8	7.9	60.0	10	0.645
		Large motion	54.8	8.5	60.0	10	57.4	5.3	60.0	0	<.001
		Delicate motion	58.4	3.8	60.0	0	59.2	3.3	60.0	0	0.004
		Problem solving	56.4	6.1	60.0	5	58.0	4.9	60.0	0	0.002
		Personal-social	53.7	7.6	55.0	10	54.1	7.5	55.0	10	0.626
		Test final	278.0	21.2	285.0	25	282.7	22.1	290.0	25	0.004
Age (year)	<30 (*n*=316)	Communication	55.1	6.5	60	10	55.9	5.6	60	5	0.478
		Large motion	55.1	8.2	60	10	56.1	6.7	60	10	0.402
		Delicate motion	58.6	3.6	60	0	59.1	3.1	60	0	0.184
		Problem solving	56.4	6.1	60	5	57.1	5.2	60	5	0.387
		Personal-social	53.4	7.8	55	10	53.7	6.6	55	10	0.804
		Test final	278.4	20.7	285	30	280.2	19.6	285	25	0.576
	≥30 (*n*=295)	Communication	55.0	7.1	60	10	54.9	7.6	60	10	0.810
		Large motion	55.0	7.7	60	10	57.0	6.5	60	0	0.002
		Delicate motion	58.0	5.5	60	0	58.6	4.7	60	0	0.090
		Problem solving	57.0	6.1	60	5	57.5	5.1	60	5	0.808
		Personal-social	53.6	7.9	55	10	54.4	7.9	55	10	0.425
		Test final	278.4	23.4	285	20	281.7	24.2	290	25	0.119

*Mann-Whitney *U* Test

can enhance physical activity, particularly in relation to movement activities such as running. Moreover, children are more inclined to concentrate on exploring their immediate surroundings as well as things in the environment.[22] Infants commonly engage in the process of imitation as a normal facet of their developmental progression. Furthermore, they often exhibit extended periods of connection with their siblings, which may

be particularly pronounced in contemporary times.[23] Research has demonstrated that children's rudimentary motions can manifest even in the absence of external stimuli. Subsequently, the foundational motor skills of children undergo development, wherein the influence of older siblings can serve as a mediator, facilitating adjustments in the acquisition of both gross and fine motor abilities.[24] Put differently, the simple existence of a sibling inside the household not only ensures that the child possesses enhanced motor skills but also signifies that this interaction serves as a stimulating setting, hence amplifying the level of physical activity initiated by the sibling.[25] The process of children's motion development is predominantly embodied, although it is undeniably impacted by environmental influences and notably triggered by the congruence between the child's physicality and the obstacles presented by their surroundings and culture.[26-28] This study revealed that, with regards to the variables examined, there was no statistically significant association between the presence of siblings and the levels of problem-solving skills, personal-social skills, and communication skills in infants. However, it is worth noting that a significant relationship was observed between the presence of siblings and the development of fine and gross motor skills. Given the inherent growth nature of these talents, they necessitate a significant investment of time. The initial disparities observed in children's trajectories throughout their early stages of development have the potential to magnify over time.[29] Based on the aforementioned rationales, it appears implausible to anticipate a substantial influence on locomotion, cognitive abilities, and socio-emotional competence from a developmental standpoint, given the limited duration of cohabitation with siblings. According to the findings of Rebelo *et al*.,[30] it was observed that while employing the core motion skills evaluation, there appeared to be a greater ease in discerning variations in motion skills performance as compared to stimulation. Since that the motion, problem solving, and personal-social competences develop as a lifelong effect, should be understood as a hidden variable, and for this reason, their development is expected to take longer time duration. Among the limitations of this research, it is implied to being limit of the studied babies to a specific region, namely Semnan city, as well as the lack of examination of children's weight status and the level of extracurricular physical activity, the age difference of the babies with their siblings.

Regarding the other areas of the questionnaire, although the results of the present study did not show a significant difference between the two groups of children under study, numerically, in all cases, the scores of children with siblings were higher than the other group. This means that the lack of statistical significance is probably due to two factors, the relatively small effect size and the limitation of the sample size.

In the comparisons made in the subgroups, it was observed that the relationship obtained is independent of the gender of the child, and this conclusion can be partly related to the balance of the number of girls and boys and the subsequent increase in statistical power in the analysis of the subgroups under discussion. However, the results of the analysis in the age and educational groups of the mothers better confirm the existence of the same relationship in mothers with university education and mothers with older age, and this difference can be partially due to the imbalance of the number of mothers in the defined subgroups.

Conclusion

This study showed that babies with siblings, independent of gender, had a greater chance for better acquisition of gross motor skills than babies without siblings. These results confirm that having siblings probably has an impact on the development of social and personal skills due to the increase in the social interaction of the child in the family. Emphasizing the positive impact of having brothers and sisters on a child's growth and development can be a motivating factor for having more children specially in young parents. It is suggested that this issue should be taken into the attention of researchers and policymakers in incentive programs to have children and move away from single-childhood.

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Conflicts of interest

There are no conflicts of interest.

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