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Comparison of gross motor development of 3-7 years old children in different geographical regions

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Abstract

This study was carried out to determine whether gross motor development of 3-7 years old children differed according to their geographical regions. 131 children from the Mediterranean Region, 149 children from the Southeastern Anatolia Region, 214 children from the Marmara Region, 107 children from the Aegean Region, 114 children from the Black Sea Region, 161 children from the Central Anatolia Region, 115 from the Eastern Anatolia Region children were included in the study. Of the children participating in the study, 475 were girls and 516 were boys. In order to collect data, Test of Gross Motor Development-Second Edition (TGMD-2) was used. Kruskal Wallis H test was used to compare locomotor, object control and gross motor total test scores of the three, four, five, six and seven age groups children according to the geographic regions. The results of the analysis showed that locomotor subtest scores of children aged 5 and 7 years were differentiated according to their geographical regions. Mann Whitney U test was used to determine the difference between the two groups. As a result of the paired comparisons, locomotor subtest scores of children in five age group living in Black Sea Region were found to be significantly lower than locomotor subtest scores of children living in Southeast Anatolia, Marmara and Central Anatolia Regions. The locomotor subtest scores of the children seven age in the Black Sea Region were significantly higher than the locomotor subtest scores of children living in Southeast Anatolia and Eastern Anatolia Regions. In addition, it was determined that gross motor total test scores of the children of seven age groups differed according to the geographical region. As a result, gross motor total test scores of children in seven age group living in the Black Sea Region were found to be significantly higher than the gross motor total test scores of children living in Eastern Anatolia.

Key Words: Gross motor development, children, TGMD-2, geographical region

INTRODUCTION

There is movement in all periods of life. Life is unimaginable without movement. Human movement starting from birth and continuing until the end of life develops from simple reflexive, random movements to highly complex models coordinated at higher nerve centers. While simple movements and locomotor models are obtained in infancy, a great number of motor skills are added to the movement repertoire during childhood. Previously complex movements become automatic over time (53).

Human development is continuous, but the rate of development differs in all ages. The development of the motor skills of the individual is in the same direction with physical development. The difference in development rate is also important during physical and motor developmental periods. The role of motor skills in recognizing and managing child independence is important for its existence in terms of adaptation to the environment and presence in social activities (31, 39). Most motor developers agree that a child's major muscle skills develop to a significant degree in the first eight years of life (13, 17, 22, 38).

The motor performance of the child plays an effective and an important role in peer point of view to the child (17, 51). A child with less skill than his or her peers will often be the last person selected to participate in group games or out of school activities. This will certainly have a negative impact on the child's own physical and emotional development (49).

Gallahue (16), who carried out intensive studies on motor development, demonstrated that motor development started in the prenatal period and a motor development model consisting of four periods, including older ages. This developmental model consists of different stages in each period. The period when reflexes are considered as the beginning of motor development, the baby protects himself and pioneer in his vital activities is called

“reflexive movements period “. The period of reflexive movements covers between 0-1 years of age, and this period occurs in two stages, from the first four months of uterine development and the age of four months to one year. The movements that occurred in this period are considered to be the first motor movements of the baby and the first sources of information acquisition. After the period of reflexive movements "primitive movements period" come. The period of primitive movements is accepted as the first voluntary movements occurring between 0-2 years of age. These movements are skills such as sitting, crawling and standing. The emergence of this period due to maturation follows a predetermined sequence. The period of basic movements covering the period between the ages of 2 and 7 is a period in which basic skills are acquired. This period includes basic motor skills such as balance, running, jumping, catching, throwing and kicking the ball. This period of basic movements is a period in which the child is rapidly reaching to the top of the developmental level and major changes are observed. Locomotor movements, such as running, hopping and jumping and manipulative skills such as throwing and catching are some of their movement abilities. These abilities are combined by the child over time and, after the child brings together the forms of movement, sporty skills are formed. The period of sportive movements of motor development appears as an extension of the period of basic movements. This period, which covers seven years of age and later, is a period in which the control and realization of movements are at a good level. Team games, taking part in different sports branches and similar activities, is a period (18, 19, 32).

In many studies, it has been observed that physical activity and exercise programs as an environmental factor, movement training, professional level sports and motor development have a positive effect on motor development and different motoric characteristics of children (2, 3, 8, 11, 21, 25, 45, 47, 50). There are many studies investigating the effects of having any disability group such as vision, hearing, mental and physical on motor development (4, 5, 6, 23, 35, 52). In addition to studies (20, 29, 30) comparing the physical and motor characteristics of the athletes interested in sports in different branches; there are also studies (1, 27, 37, 48) that compare the physical and motor characteristics of those who do regular and scheduled sports and those who do not.

The extent to which motor skills develop depends on a variety of motor factors such as mental and emotional (7). Therefore, many variables have been studied and tested to reveal the factors affecting motor development (14, 24, 33, 34, 36, 44). When these variables are examined, it is seen that there are no studies showing that the motor development of children varies according to the geographical regions. The most well-known definition of the geographical region is the part of the land that is similar to its specific geographical features and separated from other regions with these characteristics. In general, the region refers to sub-units in a country. The geography of the region is one of the sub-branches of the geography and it is the examination of the interaction of human and environment within the restricted area (9). In meaning of whether natural and geographical, or economic, functional and social, in the historical development process, territorial and regional differences occur due to economic or cultural development in different countries or regions (15, 28). This raises the question of whether the motor development is affected by the geographical region variable. Therefore, the answer to the question of whether the motor development of children between the ages of 3-7 years differentiate according to geographical region was investigated in this study.

MATERİAL & METHOD

Research Model

This research is a general screening model. In accordance with the purpose of the study, it has been carried out to determine whether the motor development of three, four, five, six and seven age group children differs according to the geographic region they live in.

Participants Participants

The exemplification of the study consisted of children aged 3-7 living in the different geographical regions of Turkey. Population and housing survey data of Turkish Statistical Institute were used (46) in identification of the distribution by age and gender of children ages 3-7 living in Turkey.

To determine distributions for the exemplification:

a)Based on the 2011 data of Turkish Statistical Institute, the number of boys and girls aged between 3-7 years was determined in various provinces located in different regions of Turkey

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b) The provinces were divided according to their regions and the numbers of girls, boys and children between the ages of 3-7 in each region were determined.

The sample of the study consisted of 991 children between 3-7 years old in 14 cities selected from seven regions, two provinces in each region to represent in Turkey. The stratified sampling method was used to determine the adequacy of the exemplification in determining the sample. The sample size was determined as % 95 precision level of theoretical sample sizes for different size exemplification and the number of samples which could be tolerated at 2.5% was 891. The number of samples was determined as 991 children aged between 3-7 years, considering the possible data losses.

After the sampling method and the number of samples are determined, children to be sampled by provinces, age and gender:

- Distribution of children by the geographical regions,
- Age distribution of children in geographical regions,
- Gender distribution of children in geographic regions by age,
- Percentage distributions of the provinces that make up the geographic region,
- The randomized (random) children of the sample group were determined.

When the provinces in the seven geographical regions forming the study exemplification were determined by random method, the sampling status of the selected provinces was taken into consideration and the determination of the sample provinces was carried out by the researchers. While the sample provinces were selected, attention was paid to include one of the metropolitan provinces in each region. Istanbul, Ankara, Izmir, Adana, Samsun, Erzurum and Diyarbakır were selected from the Marmara, Central Anatolia, Aegean, Mediterranean, Black Sea, East Anatolia and Southeast Anatolia regions for exemplification of the study, respectively. In the selection of the second provinces, the second largest province of the region was taken by taking into consideration the age and sex distribution according to data report of the Turkish Statistical Institute. For this purpose, Aydın, Mersin, Şanlıurfa, Elazığ, Trabzon, Konya and Tekirdağ provinces were included in the sampling.

Table 1. Distribution of children by seven geographical regions, age and gender

Sex	Geographical Region	Age					Total
		3	4	5	6	7	
Boy	Mediterranean	13	15	12	12	14	66
	Southeast Anatolia	16	16	15	14	16	77
	Marmara	23	24	22	22	22	113
	Aegean	11	12	11	11	12	57
	Black Sea	12	12	12	12	12	60
	Central Anatolia	18	16	18	15	17	84
	East Anatolia	12	10	11	12	14	59
	Total	105	105	101	98	107	516
Girl	Mediterranean	13	13	14	13	12	65
	Southeast Anatolia	14	15	15	14	14	72
	Marmara	21	20	20	20	20	101
	Aegean	10	10	10	10	10	50
	Black Sea	11	11	11	10	11	54
	Central Anatolia	16	16	15	15	15	77
	East Anatolia	12	9	12	12	11	56
	Total	97	94	97	94	93	475

According to Table 1, 131 (13%) children from Mediterranean Region, 149 (14%) children from Southeastern Anatolia Region, 214 (22%) children from Marmara Region, 107 (11%) children from Aegean Region, Black Sea Region 114 (12%) children, 162 children (16%) from Central Anatolia and 115 (12%) children from Eastern Anatolia Region were included in the study. 48% (n = 475) of the children who participated in the study were girls and 52% (n = 516) were boys.

Table 2. Distribution of children by age

Age		Minimum	Maximum	$\bar{x}$	S
3	202	36	47	41.98	3.70
4	199	48	59	53.78	3.27
5	198	60	71	65.92	3.34
6	192	72	83	77.67	3.56
7	200	84	95	89.46	3.44
Total	991	36	95	65.63	17.23

The maximum and minimum values, average and standard deviations of the ages of children in five different age groups were given in Table 2.

The mean age of the children was 41.98, 53.78, 65.92, 77.67 and 89.46 months in 3,4,5,6 and 7 age groups, respectively. The mean age of 991 children was 65.63 months and the standard deviation was 17.3.

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Data Collection Tools

In order to measure gross motor development of 3-7 year-old children, the Test of Gross Motor Development-Second Edition (TGMD-2), which was developed by Ulrich (49), was adapted to Turkish by Tepeli, Arı and Büyüköztürk (42) was used. Information about the personal characteristics of children was obtained through the personal information form.

Test of Gross Motor Development-Second Edition (TGMD-2)

Test of Gross Motor Development-Second Edition (TGMD-2) consists of two sub-scales. These are locomotor and object control. In locomotor subtest; there are 6 skills, including running, galloping, hopping, leaping, horizontal jumping, and sliding. In object control subtest; there are 6 skills, including striking a stationary ball, stationary dribble, kick, catch, overhand throw, and underhand roll. Each motor skill included in the subtests includes behavioral sections ranging from 3 to 5 given as performance criteria. These behaviors represent a certain part of the skill. A total of 24 motor skill criterions are included in both the locomotor subtest and the object control subtest. Each skill is made to the child twice and both trials are scored. If a child conducts a behavior section correctly; 1 point, 0 is given if he/she can't do correctly. Following the scoring of each of the two trials, the researcher collects the scores of the two trials to obtain a raw score related to each skill (such as running, galloping and leaping). Skill scores are summated and sub-test scores are obtained. The maximum score that can be obtained from both sub-tests is 48. The reliability coefficient of TGMD-2 for Turkish children is .78 for locomotor subtest, .74 for object control subtest and .83 for gross motor total test score (41, 43).

Gathering Data

In order to collect data from children between the ages of 3-7, seven geographical regions and educational institutions in fourteen different provinces, the relevant units of the Ministry of National Education and the General Directorate of Child Protection Agency were granted permission. While research data, locomotor, object control and gross motor total test scores, were obtained from the Test of Gross Motor Development-Second Edition, the data for age, gender, geographical regions and variables related to province were obtained from the personal information form filled by children's families.

Primary schools and preschool education institutions were determined by consulting with Provincial Directorate of National Education and Provincial Directorate of Social Services and Child Protection. Teachers in the designated educational institutions were first informed about the purpose of the study. Then, together with the teachers, the children who would be applied TGMD-2 randomly were determined based on age and gender variables. With the help of the teachers, information on the personal characteristics of these children was obtained.

To minimize the application time of the test and to eliminate the distractions, the environment was organized before starting the test. All materials required for testing were prepared in advance. Rubber-based shoes were used in different numbers to prevent incidents such as sliding and falling during the test.

In the implementation of TGMD-2, children were put into practice in groups of 3 persons. Before implementation of the TGMD-2 test, students in each group were given the necessary explanations regarding the test. A preliminary trial was carried out by the researcher to enable the child to understand his / her skill. During the measurement process, the child was given two skills each time and the performance criterion in each trial was scored separately. The application period lasted 15 minutes on average for each child. The practice carried more play characteristics and was often encouraged to keep children's interest in skills vigilant and to provide them with more performance. In doing so, the test methods were not excluded. For example, commands such as throw powerful or leap further were given. Research data were obtained from 991 children.

Statistical Analyzes

SPSS 22.0 package program was used to analyze the data obtained from the Test of Gross Motor Development-Second Edition (TGMD-2) and personal information forms. Because the number of subjects in most of the groups to be compared is below 30, comparison of locomotor, object control and gross motor total scores of the three, four, five, six and seven year-old children according to the geographical regions was performed by Kruskal Wallis H Test (12). As a result of Kruskal Wallis H

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Test, the differences between the groups were analyzed by Mann Whitney U Test. Statistical significance was accepted as 0.05.

INTERPRETATION OF ANALYSIS AND FINDINGS

The results of the Kruskal Wallis H test of the scores obtained from the locomotor subtest of the Test of Gross Motor Development-Second Edition (TGMD-2) in 3-7 years old children living in seven different geographical regions were given in Table 3.

Table 3. Results of Kruskal Wallis H Test according to geographic regions for locomotor subtest scores in 3-7 years old children

Age	Geographical Region	n	Average	sd	X^2	p	Meaningful Difference
3	Mediterranean	26	111.44	6	6.067	.416	-
	Southeast Anatolia	30	108.60				
	Marmara	44	86.89				
	Aegean	21	107.74				
	Black Sea	23	114.87				
	Central Anatolia	34	93.34				
	East Anatolia	24	101.94				
4	Mediterranean	28	102.80	6	4.364	.628	-
	Southeast Anatolia	31	112.10				
	Marmara	44	96.40				
	Aegean	22	98.07				
	Black Sea	23	108.20				
	Central Anatolia	32	84.86				
	East Anatolia	19	102.29				
5	Mediterranean	26	91.87	6	16.737	.010	Black Sea-Southeast Anatolia Black Sea-Marmara Black Sea-Central Anatolia
	Southeast Anatolia	30	110.25				
	Marmara	42	119.57				
	Aegean	21	94.62				
	Black Sea	23	76.57				
	Central Anatolia	33	106.68				
	East Anatolia	23	84.54				
6	Mediterranean	25	85.04	6	5.453	.487	-
	Southeast Anatolia	28	98.79				
	Marmara	42	103.86				
	Aegean	21	86.29				
	Black Sea	22	114.48				
	Central Anatolia	30	93.27				
	East Anatolia	24	89.40				
7	Mediterranean	26	116.19	6	19.865	.003	Black Sea-Southeast Anatolia Black Sea-East Anatolia
	Southeast Anatolia	30	89.67				
	Marmara	42	102.67				
	Aegean	22	97.32				
	Black Sea	23	133.98				
	Central Anatolia	32	99.64				
	East Anatolia	25	66.64				

When Table 3 is examined, it is seen that the children living in the Black Sea Region have the highest number of locomotor subtests in the three age group. The lowest number of locomotor subtests was in children living in Marmara Region. The highest locomotor subtest in the four age group has children in Southeast Anatolia Region while the lowest locomotor sub-test sequence has children in Central Anatolia Region. In the five-year age group, children living in the Marmara Region have the highest number of locomotor sub-test rankings while the lowest locomotor sub-test rank has children living in the Black Sea Region.

In the six age group, the highest locomotor subtest in the Black Sea Region and the lowest locomotor sub-test order in the Mediterranean Region in the average were determined. The highest locomotor sub-test sequence average in the seven years age group was observed in the Black Sea region, while the lowest locomotor sub-test sequence average was observed in children in Eastern Anatolia Region. Results indicated that only five years [X2 (SD = 2, n = 198) = 16.737, p <.05] and seven years [X2 (SD = 2, n = 198) = 19.865, p <.05] test scores were differentiated according to their geographical regions. As a result of the paired comparisons: It was determined that locomotor sub test scores of children in five age group living in Black Sea Region were significantly lower than locomotor subtest scores of children living in

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Southeast Anatolia, Marmara and Central Anatolia Regions ($p < .05$). The locomotor subtest scores of the children living in the Black Sea Region were significantly higher than the locomotor subtest scores of children living in Southeast Anatolia and Eastern Anatolia Regions in the seven age group ($p < .05$).

Table 4 shows the results of the Kruskal Wallis H test according to the geographic regions where 3-7 years old children score from the Object Control sub-test of the Test of Gross Motor Development-Second Edition.

Table 4. Results of Kruskal Wallis H Test according to geographic regions for object control subtest scores in 3-7 years old children

Age	Geographical Region	n	Average	sd	X^2	p	Meaningful Difference
3	Mediterranean	26	104.19	6	6.884	.332	-
	Southeast Anatolia	30	114.30				
	Marmara	44	89.81				
	Aegean	21	93.19				
	Black Sea	23	115.20				
	Central Anatolia	34	91.25				
	East Anatolia	24	112.69				
4	Mediterranean	28	103.79	6	2.199	.900	-
	Southeast Anatolia	31	99.37				
	Marmara	44	96.70				
	Aegean	22	112.57				
	Black Sea	23	104.15				
	Central Anatolia	32	91.23				
	East Anatolia	19	98.26				
5	Mediterranean	26	107.12	6	9.196	.163	-
	Southeast Anatolia	30	125.12				
	Marmara	42	91.62				
	Aegean	21	92.00				
	Black Sea	23	89.59				
	Central Anatolia	33	90.41				
	East Anatolia	23	101.67				
6	Mediterranean	25	91.14	6	4.818	.567	-
	Southeast Anatolia	28	97.13				
	Marmara	42	97.38				
	Aegean	21	97.36				
	Black Sea	22	118.07				
	Central Anatolia	30	91.98				
	East Anatolia	24	84.94				
7	Mediterranean	26	100.50	6	8.977	.175	-
	Southeast Anatolia	30	101.08				
	Marmara	42	97.18				
	Aegean	22	114.27				
	Black Sea	23	118.87				
	Central Anatolia	32	102.28				
	East Anatolia	25	74.08				

According to the results of the Kruskal Wallis H Test, which was conducted to determine whether the object control skills of children in three, four, five, six and seven age groups differ according to the geographic regions they live in; no statistically significant difference was found between the object control sub-test scores of 3-7 years old in terms of geographic region ($p > 0.05$).

Kruskal Wallis H Test results for gross motor total test scores of children in three, four, five, six and seven age groups according to geographic region were given in Table 5.

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Table 5. Results of Kruskal Wallis H Test according to geographic regions for gross motor total test scores in 3-7 years old children

Age	Geographical Region	n	Average	sd	X^2	p	Meaningful Difference
3	Mediterranean	26	108.62	6	7.974	.240	-
	Southeast Anatolia	30	113.03				
	Marmara	44	87.94				
	Aegean	21	98.36				
	Black Sea	23	118.74				
	Central Anatolia	34	88.69				
	East Anatolia	24	108.60				
4	Mediterranean	28	105.27	6	3.155	.789	-
	Southeast Anatolia	31	107.08				
	Marmara	44	96.52				
	Aegean	22	107.48				
	Black Sea	23	103.20				
	Central Anatolia	32	86.17				
	East Anatolia	19	99.50				
5	Mediterranean	26	95.56	6	10.575	.102	-
	Southeast Anatolia	30	123.03				
	Marmara	42	105.21				
	Aegean	21	94.33				
	Black Sea	23	74.13				
	Central Anatolia	33	99.30				
	East Anatolia	23	93.20				
6	Mediterranean	25	85.76	6	7.092	.312	-
	Southeast Anatolia	28	100.75				
	Marmara	42	99.25				
	Aegean	21	92.86				
	Black Sea	22	121.57				
	Central Anatolia	30	90.92				
	East Anatolia	24	85.10				
7	Mediterranean	26	107.56	6	16.046	.014	Black Sea-East Anatolia
	Southeast Anatolia	30	99.00				
	Marmara	42	97.32				
	Aegean	22	110.02				
	Black Sea	23	127.76				
	Central Anatolia	32	102.42				
	East Anatolia	25	64.38				

When Table 5 is examined, it is seen that gross motor total test scores of the children in only seven age group differed according to the geographical area of study, X2 (sd = 2, n = 198) = 16.046, p <.05. As a result of the paired comparisons with the Mann Whitney U test to determine the significant difference between these groups; It was determined that gross motor total test scores of children in seven age group living in Black Sea Region were significantly higher than gross motor total test scores of children living in Eastern Anatolia Region (p <.05). When the average of the gross motor total test score of the children in other age groups determined according to the geographic regions is examined; the highest average was in children living in the Black Sea Region for children aged three years, in children living in the Aegean Region for children aged four years and in children living in the Southeast Anatolia Region for children aged five years.

CONCLUSION AND EVALUATION

In In children, 3-7 years range corresponds to the period of basic movements in motor development (16). The movement of children in the period of basic movements is considered as an indispensable element of learning and communication. It is stated that the skills learned during this period are permanent for life and are the basis for their new skills. On the other hand, movement or trial facilities are not given or restricted, and this negatively affects motor skill performance in children (26). The extent to which skills develop in this period depends on a wide variety of mental, emotional and motor factors (7). This period is a critical period in which children

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display examples of physical activity behaviors (10). The individual communicates with the environment through motor behaviors. The role of motor skills in recognizing and managing the independence of the child is important in terms of adaptation to its environment and presence in social activities (31, 39).

According to the findings of this study, in which the motor development of 3-7 years old children were compared, only the locomotor subtest scores of five years and seven age group children were found to be significantly different according to their geographic regions ($p < .05$). It has been determined that the differentiation for locomotor skill originated from the Black Sea Region. While there was no significant difference ($p > .05$) in children's object control skills in terms of the geographical region, the gross motor total test scores of the children were significantly different in only seven years of age ($p < .05$). The locomotor subtest scores of the children in five years of age in the Black Sea Region were significantly lower than the locomotor subtest scores of children living in Southeast Anatolia, Marmara and Central Anatolia Regions ($p < .05$). The locomotor subtest scores of the children living in the Black Sea Region were significantly higher than the locomotor subtest scores of children living in Southeast Anatolia and Eastern Anatolia Regions in the seven age group ($p < .05$). It was determined that gross motor total test scores of children in seven age group living in Black Sea Region were significantly higher than gross motor total test scores of children living in Eastern Anatolia Region ($p < .05$).

The comparison findings based on the geographical region variable pointed out that there was no significant difference in gross motor development of 3-7 years old children. Although the Black Sea Region made a significant difference, there was no very big practical meaning. In other words, these differences were not enough to make a sense. Gross motor development of children living in seven different regions were similar in five different age groups.

When planning the study, it was thought that every region in the whole country had different possibilities, characteristics, experiences and problems (15) which affected the development, especially the motor development. How much physical activity is provided to the child, the motor developmental characteristics of the child will be affected in such a positive way, because physical activity positively affects the development of motor skills (2). The geographic regions that differ in many features will have different opportunities for families and children.

In the literature, based on geographical regions in Turkey, there are no studies examining whether it differs by geographic region. However, there are studies that compare Turkey with other countries. Tanır et. al. (40) compared the anaerobic power performance and anthropometric and motoric characteristics of Turkish and Iranian sedentary women. In the study, there was a differentiation between anaerobic power performance among Turkish and Iranian sedentary women; there was no difference between the other anthropometric and motoric features. Pala and Kolayiş (38) compared the recreational activities of 11-15 years old children in different regions. While 37.9% of the children in the South East Anatolia Region evaluated their leisure time as sport, 53.3% of them chose football as the sportive activity for recreational purposes. In the Marmara region, 51.5%, 25.6%, 21.6% and 12.8% of them chose and marked sport, football, badminton and basketball, respectively.

As a conclusion, there were no significant differences between the motor developments of children in different geographical regions, Turkey. In order to demonstrate to what extent the conditions of the experience and the possibilities offered to the child affect the motor development of children, there is a need for studies comparing the samples with different environmental factors such as physical living conditions, socio-economic level, and nutrition habits.

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