Sportis
Revista Técnico-Científica del Deporte Escolar, Educación Física y Psicomotricidad
Scientific Technical Journal of School Sport, Physical Education and Psychomotricity

Published by: Campus Educa Sportis. Collaborator: University of A Coruña A Coruña. Spain

E-mail: v.arufe@udc.es Web: www.sportisjournal.com

ISSN-e 2386-8333

Original article. A cross-sectional study on the determinants of parents' giving vitamin C to their children engaged in sportive activities. Vol. 12, n. º 2; p. 1-23, April 2026.
https://doi.org/10.17979/sportis.2026.12.2.13115

A cross-sectional study on the determinants of parents' giving vitamin C to their children engaged in sportive activities

Estudio transversal sobre los factores determinantes de la administración de vitamina C por parte de los padres a sus hijos que realizan actividades deportivas

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Editorial schedule: *Article received 01/02/2026 Accepted: 10/03/2026 Published: 01/04/2026*
https://doi.org/10.17979/sportis.2026.12.2.13115

To cite this article use the following reference:
Yücel, A.S.; Korkmaz, M.; Özpinar, S.; Öztaş, D.; Düz, S.; Cihaner, P.; Kuyucu, M. (2026). A cross-sectional study on the determinants of parents' giving vitamin C to their children engaged in sportive activities. *Sportis Sci J*, 12 (2), 1-23 https://doi.org/10.17979/sportis.2026.12.2.13115

Contribución del autor: Todos los autores contribuyeron de manera equitativa al trabajo.

Financiamiento: El estudio no obtuvo financiamiento alguno.

Conflicto de intereses: Los autores declaran no tener ningún tipo de conflictos.

Aspectos éticos: El estudio declara los aspectos éticos pertinentes.

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Abstract
The primary objective of this study is to examine the sociodemographic determinants influencing parents' administration of vitamin C to children participating in sports activities. The research was conducted with the participation of 697 parents residing in various districts of Istanbul and having children aged 9–18 years. Data were collected using a questionnaire and analysed using logistic regression, chi-square test, t-test, and multiple regression analyses in the SPSS 25 programme. The child's regular vitamin C use was considered the dependent variable. The parents' educational level, income level, occupational status, and family structure were evaluated as independent variables. When evaluating the findings, we observed that as the level of education increased, parental awareness became more pronounced. In particular, we found that the rate of regular vitamin C use was significantly higher among children of parents with high income levels, university degrees, and office jobs ($p<0.05$). Another finding was that individuals who exercised regularly were more aware. It was also determined that vitamin C use is more prevalent among children who engage in significantly more weekly exercise and are younger in age ($p<0.001$). In conclusion, parents' socioeconomic and educational levels play a decisive role in children's immune support behaviours. These findings have the potential to contribute to the development of parent-focused educational programmes and health policies aimed at supporting children's health.
Keywords: vitamin c use; parental attitudes; sportive children; supplementary foods

Resumen
El objetivo principal de este estudio es examinar los determinantes sociodemográficos que influyen en la administración de vitamina C por parte de los padres a los niños que participan en actividades deportivas. La investigación se llevó a cabo con la participación de 697 padres residentes en diversos distritos de Estambul y con hijos de entre 9 y 18 años. Los datos se recopilaron mediante un cuestionario y se analizaron utilizando regresión logística, prueba de chi-cuadrado, prueba t y análisis de regresión múltiple en el programa SPSS 25. El consumo regular de vitamina C por parte del niño se consideró la variable dependiente. El nivel educativo de los padres, el nivel de ingresos, la situación laboral y la estructura familiar se evaluaron como variables independientes. Al evaluar los resultados, observamos que, a medida que aumentaba el nivel de educación, la conciencia de los padres se hacía más pronunciada. En particular, encontramos que la tasa de consumo regular de vitamina C era significativamente mayor entre los hijos de padres con altos niveles de ingresos, títulos universitarios y trabajos de oficina ($p < 0,05$). Otro hallazgo fue que las personas que hacían ejercicio regularmente eran más conscientes. También se determinó que el consumo de vitamina C es más frecuente entre los niños que realizan una cantidad significativamente mayor de ejercicio semanal y son más jóvenes ($p<0,001$). En conclusión, los niveles socioeconómicos y educativos de los padres desempeñan un papel decisivo en los comportamientos de apoyo inmunológico de los niños. Estos hallazgos pueden contribuir al desarrollo de programas educativos centrados en los padres y políticas sanitarias destinadas a apoyar la salud de los niños.
Palabras clave: consumo de vitamina c; actitudes de los padres; niños deportistas; alimentos complementarios

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Introduction

In recent years, vitamin C (ascorbic acid) has become widely used in supplementary products that support children's health (Maggini et al., 2010). The regulatory effect of vitamin C on the immune system in particular is strongly emphasised in the literature (Carr & Maggini, 2017). In addition, thanks to its antioxidant properties, it is reported to play an important role in reducing oxidative stress and to contribute to growth, development, and tissue repair processes at the cellular level (Traber & Stevens, 2011; Gombart et al., 2020). It is particularly noted that increased metabolic stress associated with regular physical activity may increase micronutrient requirements during childhood (Delik et al., 2024). This situation leads to more frequent consideration of supplement use in children who regularly participate in sports activities (Capra et al., 2024).

Alongside this, the literature emphasises that supplement use cannot be explained solely by biological requirements; social, cultural, and cognitive determinants also play an important role. It is reported that factors such as media influence, advertising strategies, individuals' health-related decision-making tendencies, and socio-economic status are particularly decisive in the consumption of nutritional supplements (Ertaş, 2022). Indeed, Ertaş (2022) states that individuals' tendency to take initiative in health matters and misleading advertising can increase supplement use, which can lead to unconscious and uncontrolled consumption. It is also stated that supplement usage rates are higher among individuals with higher education and socioeconomic status (Ertaş, 2022). The findings also reveal that this is shaped by social and cognitive processes.

The decision-making mechanism regarding supplement use in children is shaped by parents' health knowledge, health beliefs, and socio-economic conditions (Martín-Rodríguez et al., 2024). Theoretical approaches explaining health behaviours (e.g., Health Belief Model) reveal that parents' perceived risk and perceived benefit levels influence protective practices towards their children. Indeed, a study conducted by Filiz et al. (2024) on children aged 3–12 years showed that supplement use was significantly associated with the presence of chronic disease and skipping meals; a significant proportion of parents misjudged their children's weight status, and supplements were largely preferred for the purpose of strengthening the immune system.

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These findings reveal that supplement use is shaped not only by biological needs but also by cognitive and social determinants such as parental perceptions and health attitudes. This situation supports the theoretical framework of our current study.

Numerous studies in the literature have demonstrated that parental educational level has a direct effect on health-related decisions. Studies by researchers such as Fiskerstrand (2022), Alderman & Headey (2017), and Alp and Oral Kara (2023) report that as educational level increases, parents' capacity to access health information, evaluate that information, and make informed decisions on behalf of their children is strengthened. Similarly, a study conducted by Kurt et al. (2024) revealed that parents' health literacy levels are associated with their children's healthcare utilisation behaviours and tendencies to administer non-prescription medication. These findings demonstrate that parents' education and health literacy levels play a decisive role in children's health management. We see that the parental factor is critically important in the decision-making processes regarding health-related supportive practices for children aged 9–18.

In particular, it shows that as the level of education increases, parents' health literacy rises and the likelihood of adopting preventive health behaviours increases. A study by Sánchez-Arenas et al. (2021) reports that parents with a high level of education pay more attention to their children's nutritional quality and access healthcare services in a more conscious manner. Similarly, Carr & Maggini (2017) found that the use of products that support the immune system is closely related to parental attitudes.

Gautam et al. (2023) similarly found that socioeconomic status is considered one of the important determinants of child health behaviours. Koçak & Demir, 2023; Kılınç, (2024), report that families with higher income levels have easier access to healthcare services and use supplements more regularly. Furthermore, economic stability facilitates the development of long-term preventive health strategies by parents, as indicated in the study by Richmond et al. (2024). Job security and stable working conditions can also shape parents' attitudes towards health. Findings from a study by Amawi et al. (2024) indicate that awareness of the nutritional needs of children who participate in sports is particularly high.

Shao et al. (2021) report that regular physical activity during childhood positively affects not only physical development but also immune function. However, the literature

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also discusses that intense and continuous physical exertion may cause temporary suppression of the immune system. Therefore, Carr & Maggini (2017) investigated the role of antioxidant support in balancing exercise-induced oxidative stress. The study found that vitamin C usage rates were higher in children who participate in sports. Martini et al. (2020) also support the protective role of this supplement in their studies.

In this context, the literature has also examined the relationship between sociodemographic factors such as parental education, income level, and occupational status and children's vitamin C consumption behaviour. Research has been conducted in this direction by Safaria et al. (2024), and the findings obtained in the reviews conducted at the end of the research have been supported by the findings of other studies in other fields.

Although the current literature presents important findings, it is noteworthy that there are limited studies that comprehensively address parent-based determinants for children who participate in sports.

This study aims to examine vitamin C usage levels among children participating in regular sports activities and the parental factors influencing this usage. The research explains the relationship between parents' socio-economic and educational characteristics and their immune support behaviours. It is expected that the findings obtained in this context will contribute to this gap in the literature.

Specifically, the study defines ‘sports activities’ as regular and organised physical activities carried out by children aged 9–18 in club sports, school sports programmes, and sports centres affiliated with municipalities. These activities include both educational (formal) sports programmes and structured recreational sports events. Our research covers children who participate in sports on a weekly basis. Data collection for the study was conducted through the children's parents. In this context, the study clearly limits both the age group and the type of sporting activity examined.

Methodology and Materials

Our study examines and investigates the vitamin C consumption status of children participating in regular sporting activities and how this consumption relates to the socio-demographic characteristics of their parents. Vitamin C is recognised as an important micronutrient that supports the immune system in children (Carr & Maggini, 2017).

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However, decisions regarding supplement use cannot be explained solely by biological requirements (Çetin, 2020). This decision-making process is shaped by parents' perceptions, knowledge levels, and social conditions. In this context, the Health Belief Model suggests that parents' perceptions of their children's risk of illness and their assessment of the benefits of vitamin C use may influence protective health behaviours (Akyol & Yukay Yüksel, 2026). Similarly, social determinants such as socioeconomic status and educational level have a significant impact. In particular, parents' access to health information, their capacity to evaluate and apply that information, can be decisive in their decisions regarding supplement use for their children (Turan & Yüksel Doğan, 2022). Therefore, this study does not merely describe consumption levels. It also aims to explain the decision-making mechanism underlying vitamin C usage behaviour by evaluating parental factors within a theoretical framework (Felice et al., 2024). However, the decision to use supplements cannot be based solely on biological needs. Theoretical approaches explaining health behaviours, particularly the Health Belief Model, reveal that parents' perceived risk and benefit assessments influence preventive health practices. In this context, educational level, income, and social conditions are among the key determinants shaping parents' health decisions (Chen et al., 2022). Therefore, this study aims not only to describe vitamin C consumption but also to evaluate the parental decision-making process on a theoretical basis.

Research Model

The research was conducted using a cross-sectional survey model. This model allows for the description of the current situation within a specific time frame and the examination of relationships between variables.

Participants

The research group consisted of 697 parents of children aged 9–18 living in the districts of Küçükçekmece, Bakırköy, Beşiktaş, Kadıköy, Ataşehir and Şişli in Istanbul who regularly participated in sporting activities. Participants were included in the study on a voluntary basis. These participants were reached through sports clubs, school sports programmes, and municipal sports centres. A total of 1,542 questionnaire forms were

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distributed during the research process, and 697 forms deemed suitable for analysis were evaluated. The research lasted approximately four months.

Data Collection Tools

The scale used in the study was adapted from questionnaires used in the studies by Özçetin et al. (2010) and Tuncay and Alsaç (2024), which had previously proven their validity and reliability. Before applying the scale, a pilot study group of 50 people was formed, and the questionnaire, which was organised in line with expert opinions, was applied through face-to-face interviews. The data obtained were analysed using SPSS 25 software, and the Cronbach's alpha coefficient was calculated as 0.792. This value indicates that the scale has sufficient internal consistency.

The questionnaire consists of two sections. The first section includes demographic information such as the parents' age, education level, occupation, income status, family structure, and number of children. The second section contains questions regarding the duration of children's sporting activities, whether they engage in regular sports, and their vitamin C consumption.

Data Collection Process and Ethical Considerations

Face-to-face interviews were conducted with all participants in the study. During the interviews, the purpose of the study was clearly explained to the participants, and voluntary participation was emphasised. Informed consent was obtained from all parents participating in the study. The study was conducted in accordance with ethical principles.

Data Analysis

The SPSS 25 programme was used to analyse the data. The chi-square test, independent samples t-test, logistic regression analysis, and multiple regression analysis were applied to determine the relationships between variables. Through these analyses, the effect of parents' sociodemographic characteristics on their children's vitamin C consumption was statistically evaluated. Furthermore, the relationships between children's duration of sporting activities and regular exercise and their vitamin C consumption were also examined using a multiple regression model.

Results

Model Fit and Roc Curve Analysis were applied for this study. In the study, a logistic regression model was created to evaluate the relationship between children's

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regular vitamin C use and some socio-demographic variables of parents. The independent variables included in the model were father's education level, mother's education level, household income level (>50,000 TL) and father's occupational status (office worker or not). The dependent variable is the child's regular vitamin C use (1=regular, 0=not regular).

As a result of the logistic regression analysis, all variables in the model were found to have significant effects on vitamin C use ($p<0.001$). In particular, variables such as belonging to the high income group (B=1.73), father's occupation being an office worker (B=0.98), father's education being university graduate and above (B=1.10) and mother's education being high (B=0.96) stand out as strong predictors that increase the probability of regular vitamin C use.

The overall fit of the model was calculated as Nagelkerke $R^2=0.228$. This value clearly shows that the model explains approximately 22.8% of the variance in the dependent variable and is a moderately strong model in terms of social sciences. The predictive power of the model was also evaluated with the Hosmer-Lemeshow test and the statistical value obtained was found to be within acceptable limits with 6.86. Again, this clearly states and shows that the model is compatible with the observed and expected results.

The classification success of the model was evaluated using the Receiver Operating Characteristic (ROC) curve. The area under the ROC curve (AUC=0.78) shows that the model has a very strong discrimination ability. An AUC value above 0.70 indicates that the model is reliable in distinguishing between positive and negative classes. When evaluated in this context, the ROC curve reveals that the model has sufficient sensitivity and specificity in predicting vitamin C utilisation.

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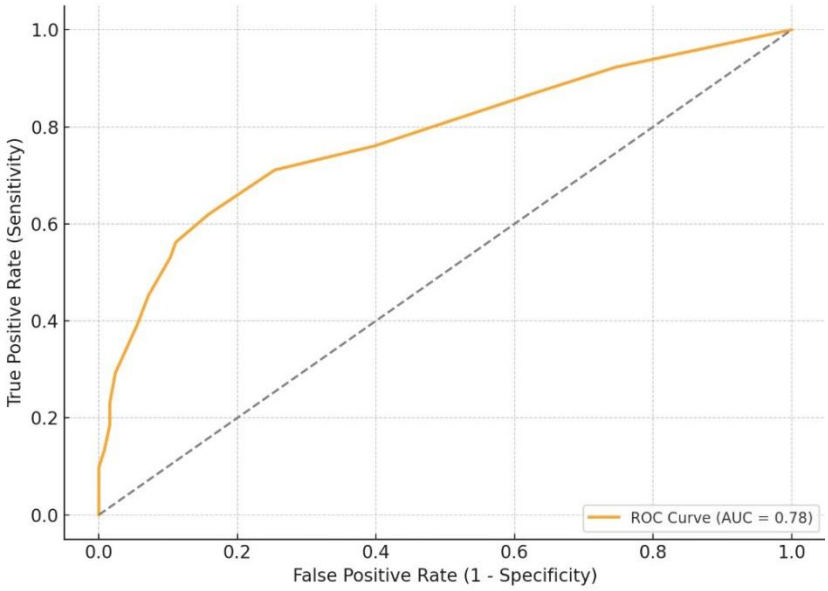

Figure 1. Roc curve - logistic regression model for vitamin c usage

Table 1. Parents: sociodemographic characteristics and regular use of vitamin C

Category	Subcategory	Regular Users (N)	Regular Users (%)	Regular Non-users (N)	Not Regularly Used (%)
Gender	Male	260	76	82	24
	Woman	235	66	120	34
Father's Age	20–35	292	69	130	31
	35+	105	38	170	62
Father's Occupation	Unemployed	80	30	190	70
	Office Worker	332	78	95	22
Father's Education	Graduate and Above	165	68	77	32
	Other	77	32	165	68
Mother's Age	20–30	253	65	139	35
	31+	199	65	106	35
Mother's Occupation	Housewife	176	49	182	51
	Working	178	53	161	47
Mother's Education	Graduate and Above	147	62	90	38
	Other	90	38	147	62
Monthly Income	30.000–50.000	100	49	105	51
	>50.000	259	81	60	19

Table 1 shows the regular vitamin C intake of children according to their parents' sociodemographic characteristics. Seventy-six per cent of male parents and 66 per cent of female parents give their children vitamin C regularly. When fathers' ages are

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examined, the rate of regular use is 69 per cent in the 20–35 age group, while this rate drops to 38 per cent among fathers aged 35 and above. Based on fathers' occupations, the usage rate is 78% among office workers and 30% among unemployed fathers. In terms of education level, regular usage is 68% among fathers with a university degree or higher and 32% among those with other education levels. In terms of mothers' age, the usage rate is 65% in both groups, with no significant difference observed. Regular usage is 53% among working mothers and 49% among housewives. The usage rate increases as the mothers' educational level increases (62% for university graduates and above). When examining income level, regular usage is 49% in the 30,000–50,000 TL income group, while it rises to 81% in the over 50,000 TL income group.

Table 2. Family and child characteristics according to regular vitamin C use

Category	Subcategory	Regular Users (N)	Regular Users (%)	Regular Non-users (N)	Not Regularly Used (%)
Birth Order	First Child	221	73	80	27
	Other	201	51	195	49
Family Structure	Core	268	71	108	29
	Wide	144	45	177	55
Number of Children	1-3	239	60	160	40
	3+	173	58	125	42
Immunity	Immune	350	93	26	7
	Not Immune	129	40	192	60

Table 2 shows vitamin C usage rates according to family structure and certain characteristics related to children. The rate of regular usage is 73% for first children and 51% for other children. According to family structure, regular usage is 71% in nuclear families and 45% in extended families. According to the number of children, regular usage is 60% in families with 1–3 children and 58% in families with more than three children. According to immunity status, the rate of regular usage is 93% in children with strong immunity and 40% in children with weak immunity.

Table 3. Logistic regression analysis

Variable	B	S.E.	Wald	p	Exp(B)
Father's education (Graduate and above)	1.214	0.512	5.624	0.018	3.368
Mother's education (Graduate and above)	0.987	0.478	4.269	0.039	2.683
Household income (>50,000)	1.578	0.556	8.071	0.004	4.842

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Father's occupation (Office worker)	0.873	0.39	5.002	0.025	2.394

The results of the logistic regression analysis presented in Table 3 include data on parents' educational level, household income, and the father's occupational status. Furthermore, the table shows statistically significant effects on the child's regular vitamin C use ($p<0.05$). It was determined that the likelihood of regular vitamin C use increased 3.368 times among children whose fathers had postgraduate or higher education (Exp(B)=3.368; p=0.018). Similarly, the likelihood of regular use increases 2.683 times when the mother's educational level is postgraduate or higher (Exp(B)=2.683; p=0.039). In families with a household income above 50,000 TL, this likelihood is 4.842 times higher (Exp(B)=4.842; p=0.004). Furthermore, the father being an office worker increases the likelihood of regular use by 2.394 times (Exp(B)=2.394; p=0.025). The findings reveal that parents' educational and economic levels play a decisive role in children's vitamin C consumption behaviour.

Table 4. Chi-square tests

Variable	Chi-Square	p-value	Comment
Gender	0.123	0.725	Not meaningful
Birth order	0.857	0.357	Not meaningful
Family type	0.408	0.523	Not meaningful
Household Income	10.645	0.01	Meaningful
Father's occupation	22.586	0.04	Meaningful
Mum training	21.141	0.03	Meaningful

The results of the chi-square test in Table 4 show statistically significant relationships between the child's regular vitamin C use and certain parental variables. Specifically, household income (χ^2=10.645; p=0.01), father's occupation (χ^2=22.586; p=0.04) and mother's educational level (χ^2=21.141; p=0.03) were found to be significant variables. In contrast, no significant relationship was found between parental gender, birth order, and family structure variables and vitamin C use.

When the significant variables are evaluated together, it is seen that vitamin C use is more related to socioeconomic factors. In particular, the father's occupational status and the mother's educational level stand out with high chi-square values. This situation indicates that economic security and educational level play a decisive role in parents' health-related decision-making processes. The significance of household income also

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supports this finding. Indeed, these results are consistent with the findings obtained in the logistic regression analysis and reveal that vitamin C usage behaviour is closely related to social and economic resources.

Within this framework, it can be said that vitamin C usage is linked to parents' socio-economic status and health awareness rather than demographic characteristics. These findings are consistent with the social determinants of health approach. Furthermore, these findings show that economic and educational resources shape preventive health practices for children.

Table 5. T-test (child age)

Group	Average Age	Standard Deviation	t-value	p-value
Using Vitamin C	12.4 years	2.3 years	2.754	0.006
Not using	14.1 years	2.6 years		

The t-test analysis in Table 4 reveals that there is a significant difference between the mean age of children who use vitamin C and children who do not use vitamin C (t=2.754, p=0.006). According to this result, the mean age of the children who used vitamin C was 12.4 years and the mean age of the children who did not use vitamin C was 14.1 years. These results show that the rate of vitamin C use decreases as the age of the child increases. This situation suggests that parental supervision for immune support is more intense in young children and supplementary products are used more frequently. In addition, children's greater participation in decision-making processes and decreased parental supervision may also explain this difference. In conclusion, child age has a statistically significant and negative effect on regular vitamin C use.

Table 6. Multiple regression (immunisation status)

Variable	B	S.E.	Beta	t	p
Vitamin C Use (1=yes)	2.134	0.724	0.341	2.949	0.004
Mother Education	1.015	0.432	0.219	2.349	0.019
Income	0.893	0.403	0.198	2.216	0.027

The multiple regression analysis results presented in Table 6 reveal the variables that influence children's immune levels. According to the analysis results, vitamin C usage positively and statistically significantly affects immune levels (β=0.341; t=2.949; p=0.004). Similarly, a significant increase in immunity levels is observed as the mother's

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education level increases (β=0.219; t=2.349; p=0.019). Household income level also has a significant and positive effect on immunity levels (β=0.198; t=2.216; p=0.027).

When the findings are evaluated together, it is seen that children's immunity levels depend not only on individual supplement use but also on the educational and economic characteristics of their parents. These results are consistent with the previous logistic regression and chi-square analyses, which found socio-economic variables to be significant. Therefore, it can be said that immunity levels are related to family-based socio-economic factors as well as individual health behaviours.

Table 7. Summary statistics

Group	Average Sport Duration (min/week)	Standard Deviation
Using Vitamin C	177.70	37.44
Not using	135.25	49.94

Table 7 shows that the average weekly physical activity time of children who used vitamin C was 177.70 minutes, whereas this time was 135.25 minutes in children who did not use vitamin C. In addition, when the standard deviation values are examined, it is seen that the duration of physical activity is more homogeneously distributed in the group using vitamin C (SD=37.44), while there is a wider variability in the group not using vitamin C (SD=49.94). These results suggest that children who use vitamin C tend to have healthier living habits not only in terms of immunity but also in terms of physical activity level. Regular vitamin C use may be parallel to a more active lifestyle as part of conscious health behaviours. According to the data in Table 6 and the results obtained, it can be said that children who use vitamin C participate in more physical activity and this behaviour may be related to general health awareness. This situation reveals the mutually supportive structure of healthy living habits.

Table 8. T-test results sport duration

Statistics	Value
t-statistic	8.411
p-value	0.000
Comment	Meaningful

According to the results of the t-test analysis in Table 8, there is ***a statistically significant difference*** between children who use vitamin C and children who do not use

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https://doi.org/10.17979/sportis.2026.12.2.13115

vitamin C in terms of weekly sports time ($t=8.411$, $p<0.001$). This strong statistical significance reveals and shows that the difference between the two groups indicates a systematic difference, not a coincidental difference. This finding suggests that children who use vitamin C have ***a healthier lifestyle*** not only in terms of immunity but also ***in terms of physical activity levels***. The fact that children who do more sports also regularly use supplements such as vitamin C suggests that general health awareness and lifestyle preferences complement each other. In general, a significant relationship was found between vitamin C use and increased physical activity duration, suggesting that the use of health supplements may be associated with a more active lifestyle.

Table 9. Chi-square results: Regular exercise and vitamin C use

Statistics	Value
Chi-square	42.791
p-value	0.000
Comment	Meaningful

According to the results of the Chi-square test in Table 9, there is ***a statistically significant relationship*** between children's regular sports practice and vitamin C use ($\chi^2=42.791$, $p<0.001$). This strong significance level shows that the two variables are not independent from each other and that there is a significant relationship between them. This finding reveals that children who engage in regular physical activity also attach more importance to vitamin C use. In other words, ***children who do regular sports are significantly more likely to use vitamin C***. Again, this situation shows that healthy living habits support each other and that these behaviours can be seen together in individuals with high health awareness. According to the analysis result of this table, it was found that there was a strong relationship between vitamin C use and physical activity and this relationship reflected the general health behaviours of children.

The results of the analyses in Tables 6, 7 and 8 above clearly show that regular sports and longer duration of physical activity may be associated with vitamin C utilisation rates in children. This difference is statistically significant since the mean duration of sports was found to be higher in children who do sports. In addition, children who do regular sports are also more likely to use vitamin C.

Discussion

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This research clearly demonstrates the importance of parental factors influencing the behaviour of giving vitamin C to children participating in sporting activities. The findings are strongly consistent with the literature.

The finding that parental educational level has a positive effect on vitamin C usage parallels studies in the literature that emphasise the decisive role of educational level on health behaviours (Kovács et al., 2024). It is known that as educational level increases, parents' health literacy improves and their awareness of nutrition and immune support strengthens (Saleh et al., 2021). However, explaining this relationship solely in terms of knowledge level is insufficient. Education also enhances critical thinking, the ability to assess health risks, and the capacity to adopt protective practices. This situation may explain parental sensitivity to increased immune sensitivity, particularly in children who exercise regularly.

The emergence of income level as a significant determinant is also consistent with findings in the literature (Benzeval et al., 2001). A high income level facilitates access to healthcare services and supplements, while also supporting the implementation of preventive health behaviours (Kraft & Kraft, 2021). However, some studies indicate that economic level alone is not a sufficient determinant, and that cultural attitudes and perceptions of health are also influential. In this context, our study is significant in terms of the combined significance of income and education; because the results show that vitamin C use is related not only to economic means but also to educational awareness.

These findings are consistent with the social determinants of health approach and reveal that preventive health practices for children are influenced by family-based socio-economic resources. Again, this situation shows that the decision to use supplements in children who play sports is shaped by the social status and health awareness of their parents rather than individual preference.

Findings regarding the effect of parental occupation are also consistent with the literature. It has been determined that parents who are office workers, in particular, give their children vitamin C supplements more regularly (Aydın & Buğa, 2020). Similarly, it is stated that parents with more stable working lives may have higher health awareness (Frosch et al., 2019). This contributes to greater support for the use of supplements for children (Aydın-Ceran et al., 2023).

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Our findings regarding the immune-supporting effect of vitamin C use in children are quite important. This is because these results reveal that ascorbic acid specifically strengthens immune cell function. They are also consistent with studies showing that it can reduce the risk of infection (Carr & Maggini, 2017). The literature frequently reports that vitamin C intake can reduce the incidence and duration of upper respiratory tract infections in particular. This effect is explained by the strengthening of antioxidant defence mechanisms and the support of neutrophil functions. Findings reported by Arı et al. (2023) regarding parental sensitivity also suggest that supplement use to support children's immune systems may be a conscious choice.

A noteworthy finding in our study is that children who used vitamin C had higher levels of physical activity. This finding is consistent with studies suggesting that healthy lifestyle behaviours tend to cluster (Otocka-Kmiecik & Król, 2020; Johnston et al., 2014). It is known that awareness of nutrition and supplement use is higher in physically active families, where parents jointly adopt preventive health practices. Findings indicating that parents of children who participate in sports have higher levels of health awareness also support this result (Levent İlhan et al., 2017).

Analyses related to age factors show that vitamin C usage rates are higher among younger children (especially those in early childhood and primary school). This can be explained by the fact that younger children are under more intensive parental supervision (Strauss, 2001). As children approach adolescence, they become more involved in health-related decision-making processes and their individual preferences increase. This situation can affect the frequency of supplement use (Koç et al., 2024). Therefore, the decrease in parental control with age can create differences in usage rates.

Although our findings are generally consistent with the literature, some differences may stem from the sociocultural structure of the sample. In the Turkish context, parents play a very prominent role in decision-making regarding children's health, which makes the impact of socioeconomic variables more apparent. In particular, the emergence of education and income level as strong determinants is consistent with the social determinants of health approach. The higher use of vitamin C among children who participate in sports may be related to parental awareness and perceptions of preventive health. The decrease in use with increasing age can be explained by the

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weakening of parental control and the child's greater involvement in decision-making processes. These results indicate that findings should be evaluated not only in terms of biological factors but also in conjunction with cultural and structural factors.

Overall, this study demonstrates that immune support strategies in children are shaped not only by individual preferences but also by parental attitudes, socioeconomic conditions, and lifestyle patterns. These findings highlight the importance of family-based approaches in the development of child health policies. They also point to the necessity of awareness programmes for parents (Kaya & Vural Yüzbaşı, 2024).

Conclusion

This comprehensive study examined the behaviour of administering vitamin C to children aged 9–18 who regularly participate in sporting activities (school physical education classes, club sports, and organised sports programmes run by local authorities). The findings indicate that this behaviour is significantly influenced by the parents' sociodemographic characteristics. It was determined that the rates of regular vitamin C use were higher, particularly in families with high income levels and among parents with university degrees. The fact that parents with job security (especially office workers) are more inclined to use supplements suggests that economic stability and health awareness are influential in this decision-making process.

The increase in vitamin C usage rates among children who exercise regularly and have a higher weekly exercise duration indicates that healthy lifestyle behaviours tend to cluster. Conducting sports activities, particularly in organised and supervised environments (e.g., school physical education programmes and club training sessions), may increase parents' sensitivity towards immune support.

When evaluated in terms of age, vitamin C use was found to be more prevalent among children aged 9–12 years. This can be explained by the fact that parental supervision is more intense during early and middle childhood, and health decisions are largely made by parents. As children progress towards adolescence, their participation in decision-making processes increases and parental control relatively decreases. This situation may also affect the frequency of supplement use.

A positive and significant relationship was also found between children's immunity levels and vitamin C use. However, it was observed that immunity levels were

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affected not only by individual supplement use but also by parents' education and income levels. This finding indicates that immunity support strategies should be evaluated within a family-based and socio-economic context rather than focusing solely on individual behaviour.

In conclusion, the data obtained reveal that parental education and economic conditions should be taken into account when planning immune support applications in children. This study provides practical data for the development of child health policies and the design of health education programmes for parents.

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