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# School bullying: consequences, risk and protective factors and successful school interventions worldwide.

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## ABSTRACT

Bullying and victimization in the school environment have been a major concern in recent years for students, parents, teachers and state authorities. The purpose of this article is to describe the multidimensional phenomenon and its short- and long-term social and emotional consequences on all parties, whether directly or indirectly involved, and to examine the risk and protective factors through Bronfenbrenner's ecological systems theory, focusing on one of the main "systems", during adolescence, that of the school. The cultivation of social skills, coupled with a consistently positive school climate, are identified as key protective factors against bullying. In addition, two particularly successful approaches to preventing and tackling school bullying internationally are presented, namely social-emotional learning (SEL) and peer support programs. Social-emotional learning is based on the cultivation of social and emotional skills, while peer support capitalizes on the key role of "bystanders". As evidenced by the existing literature, a significant number of meta-analyses have demonstrated the multiple benefits that result from the systematic implementation of social-emotional learning programs at all levels of education. Also, empirical research has shown that the proven success of peer support programs needs further documentation, as their diversity and complex structure require systematic and long-term implementation prior to their final evaluation.

**Key Words:** *bullying; risk-protective factors; socio-emotional learning; peer support*

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## Introduction

The first definition of bullying was provided by the pioneer Dan Olweus, who defined school bullying as the exposure to intentionally negative behaviors perpetrated by one or more classmates, which occur repeatedly and over long periods of time [1]. A characteristic of this phenomenon is the imbalance of power [2], and the victim's defenselessness [1] leading to significant physical, psychological, social or academic complications. Olweus [1] also distinguished this construct from unintentional "teasing", which often occurs among peers in the context of jokes, but which may turn into bullying if continued for long periods of time [3], as well as other forms of aggression [4].

A meta-analysis of the prevalence of bullying between 1999 and 2006 found a rate of 20% for bullies, 23% for victims and 8% for bully victims [5]. However, prevalence rates reported between countries differed substantially, which likely occurred due to different frequency requirements in the operational definitions employed. In a more recent meta-analysis of 80 studies and 335,519 adolescents, Modecki et al. [6] estimated the prevalence of traditional bullying at 35%, and of cyber-bullying at 15%. Also, Junoven & Graham [7] estimated that 20-25% of youth have an involvement in bullying, whether that occurs in the form of bullying, victimization or both. Finally, the cross-national HBSC 2013-2014 study [8] found bullying to be 11% for boys and 6% for girls, operationally defining it as an experience occurring 2 to 3 times a month, in the last 2 to 3 months. In Greece, the prevalence of bullying was 10.6% among boys and 4.3% among girls [8].

The most "traditional" expressions of bullying are seen in direct behaviors, in the form of physical aggression, such as hitting, punching, slapping, biting, pulling or kicking, or verbal aggression which may include cursing, mocking, insulting, irony, sarcasm, name-calling, teasing, threatening, as well as sexist, racist, homophobic and transphobic comments [9,10]. These behaviors aim to humiliate, reduce, hurt or coerce the victim [11,12]. Indirect bullying, also described as "emotional" or "relational" bullying, is a form of bullying that often passes unnoticed by parents and teachers [13].

In this situation, which is driven by the need to maintain or achieve a position in the school's social hierarchy, the victim experiences fear, insecurity or social exclusion. In the case of social exclusion, victims are intentionally left out of activities of a group of peers or are continuously avoided [14]. Relational aggression occurs most often in the developmental period of early adolescence, when students move from primary to secondary school. During this period, the social environment becomes adolescents' priority, and the restructuring of the school's social hierarchy often places strain on peer groups. Nevertheless, bullying is a common phenomenon across age groups, rather than age-specific [15, 16].

In recent years, the development of new internet technologies and their presence as an integral part of an adolescent's socialization process has been parallel to the emergence of cyberbullying [17]. Cyberbullying involves intentional aggressive behaviors which occur through technological means [18]. This may include sending aggressive and threatening messages, excluding someone online, spreading rumors or using social network systems to publish private or humiliating information [18,19].

## Social and Emotional Consequences of Bullying

For the past decade, bullying has been officially acknowledged as an important public health concern that requires the collaboration of the health, educational and family institutions for its resolution [20]. Bullying involvement has been associated with a series of negative consequences on the physical, emotional and social health of adolescents [21], some of which extend into later adulthood [22, 23]. There is a strong link between bullying involvement and poor mental health [24, 25], such as low mood and depression [26-28], as well as irritability [29].

In addition, victimized students are more likely to experience loneliness and a limited support network, evident in the absence of close interpersonal relationships [30], and poor academic performance [31]. Importantly, apart from the long-

term socio-emotional consequences bullying involvement may have on victims, exposure to victimization in the environment of bystanders has also been found to negatively impact mental health, increasing risk for aggressive behavior on their part, anxiety and somatic complaints [32].

An alternative theoretical hypothesis worth mentioning suggests that certain preexisting child socioemotional vulnerabilities or pathologies can function as precipitating conditions or trigger bullying. Namely, children with both internalizing and externalizing problems, when compared with children without these pathologies, have shown to present higher risk of involvement in bullying practices. A study conducted in 2006 [33] examined both this hypothesis and its alternative causal hypothesis (bullying as cause of pathology), by investigating exposure history. This revealed only the causal effect of bullying experience at the later stages of psychopathologic behaviors, not the opposite direction. The study offers further evidence that experiencing bullying causes the onset of symptoms that later mark psychopathologic behaviors. Of course, the process may very well be bi-directional, because, for example, pathological shyness or social isolation may function both as a cause for and a consequence of victimization. Adolescents with related problems appear to be socially inept and unpopular and, as such, more likely to fall victims of bullying, which in turn isolates them from the social group and further diminishes their social exposure and positive social interactions, making them all the more isolated and socially anxious.

### **Risk and Protective Factors**

A bio-ecological model [34-36] of development provides the theoretical ground required to study the multi-systemic factors that contribute to the development and wellbeing of adolescents. Different systems of a child's life interact in predicting bullying and victimization, and these include, but are not limited to, national legislation on the phenomenon of bullying, social norms on the behaviors and expectations of adolescents.

Multiple studies have supported that relational bullying and cyberbullying victimization are more

common among girls than boys [37-39]. However, a recent systematic review of 85 studies demonstrated that boys have consistently higher odds of perpetrating bullying than girls [40]. Regarding age, the period of early adolescence, and the transition from primary to secondary school, is a period characterized by increased risk for bullying and victimization [1,2,41-44]. Growing up, following a series of maturational brain developments, children's social abilities improve, acting protectively against bullying experiences [44]. However, during this developmental period, there is a reduction of support provided by parents and teachers, and an increase in social and academic demands, making the period of early adolescence especially demanding [41].

While the family environment is a pivotal factor for a healthy child and adolescent development, during adolescence the family loses a big part of its influence, as attention is shifted to the school environment. As such, social skills become one of the psychosocial characteristics that shape vulnerability and resilience to bullying. Poor social skills, the experience of rejection and the potential feelings of loneliness are all risk factors associated with bullying victimization in schools [30,45,46]. On the contrary, highly attuned social skills and the development of social relationships can act protectively [47,48].

As the school becomes a central arena for adolescent socialization, this "microsystem" [36] can have a substantial influence in protecting teenagers from bullying victimization [49]. Connection with one's school refers to the emotions a student may have towards his/her peers and teachers, but also a sense of safety and acceptance that is forged in such a setting. A strong school connection acts as a protective element in an array of difficulties encountered in adolescence, such as perilous behaviors, and is also associated with improved academic performance [50,51].

As mentioned in the relevant literature, a positive school climate is one of the most important protective factors in the life of an adolescent. It is described as a supportive and encouraging environment, with strong pastoral and nurturing characteristics. As such, it has been proven that it functions as a preventative mechanism against a student being involved in bullying, becoming estran-

-ged from the school environment and eventually dropping out [52].

While a universal definition of what a positive school environment should entail has not been reached to date, the consensus view of what a positive school environment should entail includes a supportive and caring attitude on the part of the teachers, support and respect amongst students, and student attachment and dedication to the school as well as a general sense of safety, deriving from an explicit and updated set of school rules [53-56]. It has been demonstrated that, when the school climate is negative, instances of bullying increase, become repetitive and become long-term engrained behaviors [57-59]. On the contrary, in a positive and supportive environment of cooperation and safety, students develop higher levels of assertiveness, empathy and socialization, while the odds of being involved in bullying decrease significantly [60,61].

According to Daily and colleagues [62], empirical research consistently demonstrates that promoting a positive school environment can be used as a very promising intervention strategy, both for the improvement of student's academic performance, but also for the wellbeing of students, through the development of "satisfaction with school" [63]. Satisfaction with school has been associated with increased levels of wellbeing [63-65] and academic success [66,67].

## **School Based Programs to Combat Bullying**

### ***Social and Emotional Learning (SEL)***

Multiple programs and interventions have been developed globally to prevent and target the phenomenon of school bullying in recent decades. The most successful interventions are believed to employ the pre-existing positive elements of the school environment [68-70], focusing on the development of social and emotional skills of children and adolescents, and promoting the creation of supportive relationships among peers [71].

Intervention by Social and Emotional Learning (SEL, has become one of the most successful and globally established educational tools to target bullying [72,73]. Based on the theory of emotional, or "multiple" intelligence, SEL is an educational intervention which can be applied to all age groups, aiming at reducing risky behaviors, increasing resilience during transitions which take place at scho-

-ol and improving academic performance [74-78]. SEL consists of five central, interrelated social and emotional skills [79] which are fostered through SEL programs [80-82].

First, self-awareness refers to an individual's ability to recognize and differentiate his or her emotions, personal competencies, interests and values, while keeping a realistic yet confident life stance.

Second, social awareness refers to an individual's ability to recognize the emotions and needs of others, and to act upon those needs, by being able to use empathic abilities to "put himself/herself in the other person's shoes" [83]. Through this skill comes the ability to value and achieve a positive interaction with different social groups, and to value the presence of differences and similarities.

Self-management is the third ability, referring to the self-regulation of emotions, stress, and impulsivity, but also to perseverance, positive expression of emotions, and the ability to set and maintain personal and academic goals.

Relationship skills refers to the capacity to create and maintain healthy and satisfying relationships, based on collaboration, and the ability to help when necessary, instead of resorting to poor coping strategies.

Finally, responsible decision making refers to the ability to make decisions based on values, safety and respect for others.

Meta-analyses support the success of this intervention in improving adolescent socio-emotional skills and wellbeing, while fostering positive attitudes and reducing divergent behaviors [84-87]. Following the evaluation of the findings of various studies, prominent researchers on social and emotional learning, have concluded that these programs should be implemented in an organized, consistent and systematic way, from kindergarten to secondary education, in order for these to deliver the best possible results [81,88-90]. Even though more follow-up studies are still needed, existing data powerfully point to the long-lasting positive effects of such programs.

### **Peer support programs**

As bullying is a social, rather than dyadic phenomenon, an important factor to address when designing a successful school intervention is the role of bystanders [91]. Empirical studies suggest that the

best way to incorporate children not involved in bullying, but present in the school culture where the phenomenon unravels, is to encourage them to participate in different peer support programs, educate them on the phenomenon and provide them with an active role as supporters within the school environment [92,93]. Peer support programs are the provision, in some way, of support from students to other students, usually in the context of an existing support scheme and under the supervision of a trained member of staff. They are founded on the notion that students will feel more comfortable receiving support from peers than adults, and are used extensively both as prevention and intervention strategies in primary and secondary but also higher education [94].

The fundamental components of peer support [92,95] are the education of adolescents in the ability to cooperate outside of one's group of friends, independent of social and racial prejudices; the ability for emotional self-management and social functioning; and finally, the education of adolescents in handling conflicts using strategies that are beneficial and less violent. Such practices include befriending schemes for vulnerable or isolated students [92,93], which often take place in primary school, and have been found to increase students' sense of safety [96]. A more complex model of peer support is peer mediation [97], or school-based mediation, wherein two or more students resolve their conflict with the help of a mediator, through a process of communication between all parties. This aims to achieve something positive out of the situation, in contrast with teachers' likely use of punishment as an immediate response to peer problems. Other programs involve active listening, where peers become trained in counseling skills [98] and cybermentoring [99], both of which are practices appropriate to older youth.

The effectiveness of peer support interventions has been described by Brady and colleagues [100], based on the outcomes of a large nationwide peer mentoring program in Ireland, the "Big Brothers Big Sisters (BBBS)". This program benefited students by creating a culture of support in school, increasing access to support to a larger number of students, even for more minor everyday issues. A systematic review by Baginsky [101] highlighted that peer mentoring can have multiple benefits for students and the school community, such as skills which will prepare students

to live healthy social relationships in their adult lives. Thompson and Smith [99] found that 1273 among 1378 participating schools used at least one type of support schemes, often adapted to the needs of the school and students. Overall, despite the disparities in their application, the peer support programs reported prevented and improved situations of bullying, with "buddy schemes" and peer mentoring turning out to be the most successful.

While extensive research on general bullying prevention is available, evidence on the effectiveness of peer support programs specifically, is still relatively limited. This calls for further documentation, as the results of various peer support interventions have not delivered the anticipated outcomes [100]. Nevertheless, focus should be placed on the high potential of these programs. Empirical research has shown that a proper, systematic and long-term application of such programs can deliver very positive results [93,95,98,99].

Peer support programs require a considerable amount of time for them to be integrated into the school culture before they start bearing fruit, first in terms of perceptions and, thereafter, in attitudes [102]. It is essential to have clear goals, a well-organized framework, and to ensure the active participation of all stakeholders: teaching and administrative staff, parents and guardians.

## Conclusion

This review presented the short- and long-term social and emotional consequences of bullying at an international level on both adolescent victims and perpetrators, as well as on peer bystanders, based on the available literature. Moreover, the risk and protective factors were examined in the light of Bronfenbrenner's *ecological systems theory* [34-36], while two successful types of school programs for preventing and tackling bullying, namely, social and emotional learning (SEL) and peer support, were presented. Furthermore, this review revealed that there is scope for further research into the ecology of bullying, as well as into the effectiveness of social and emotional and peer support programs in the long term, and always with a view to children protection and well-being, in accordance with the Convention on the Rights of the Child (UNCHR) [103].

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# Changes in health quality, lifestyle and habits in adolescents induced by COVID-19 pandemic.

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## ABSTRACT

**Introduction:** The Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-CoV-2) pandemic affected and altered several parts of our daily habits and lifestyle. Adolescents could not remain unaffected. The purpose of this review is to evaluate changes in health and daily habits of adolescents during the COVID-19 pandemic.

**Material and Methods:** A detailed search of the literature was conducted in Pubmed to find published articles related to changes in health, lifestyle and daily habits of adolescents during the COVID-19 pandemic.

**Results:** A total of 22 articles met the inclusion criteria and found suitable for this study. Additional resources from World Health Organization (WHO) and American Academy of Pediatrics (AAP) official websites provided useful information were also included. COVID-19 pandemic has caused changes in adolescents' sleep habits and quality, such as increase in sleep duration and later bed time. Screen time increased but physical activity decreased. Moreover, eating patterns were altered and there was a tendency for weight gain. Adolescents' mental health and behavior were also affected, and in many cases there an increase in mood changes, especially in depressive symptoms.

**Conclusion:** COVID-19 pandemic has unquestionably changed the adolescents' everyday habits and lives. Considering that adolescence is the period in which physical and mental development of young people take place, it should be kept in mind that the results of such effects might accompany them in their adult life.

**Key Words:** *health; lifestyle and habits; adolescents; COVID-19*

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## Introduction

The first definition of bullying was provided by According to the World Health Organization (WHO), as of 11 July 2021, more than 185 million cases of coronavirus disease 2019 (COVID-19) have been confirmed and more than 4 million deaths have been addressed globally due to severe acute respiratory syndrome coronavirus 2019 (SARS-CoV-2) [1]. WHO characterized the health crisis as a pandemic on 11th of March 2020 [2]. Consequently, restrictions were implied globally in order to minimize the spread of the virus and protect public health. Lockdowns and social distancing measures were imposed including closure of schools.

The ongoing COVID-19 pandemic affected significantly adolescents' lifestyle as well as their physical and psychological health. Adolescence is a tough period for teenagers who experience a lot of changes. Additionally under the present situation adolescents had to cope with this new everyday reality due to the restrictive measures adopted for the present pandemic. As each person faces this situation differently, teenagers also responded differently in these current conditions and adaptations. In general, adolescents stayed at home, slept more, spent more time playing with digital gadgets, while exercised less.

Following the above, the purpose of this review is to evaluate changes in health daily habits of adolescents during the COVID-19 pandemic.

## Materials and Methods

An advanced executive literature search was conducted in PubMed, using the following terms: "lifestyle AND adolescents AND covid19", "health quality AND adolescents AND covid19" "changes AND habits AND adolescents AND covid19. The resulting literature was carefully screened by a single investigator. Only studies written in English were included. Additional search filters such as text availability, article type, and publication date were not applied. Further references from the initial articles with useful information related to the aim of the review were also screened. Current data from the official website of WHO concerning the number of confirmed cases and deaths from COVID-19 were also included.

## Results

The initial literature research via Pubmed revealed 19 articles. Of them, 17 were written in English language and related with the aim of the present study. Through snowballing technique, five more articles were added. Hence, a total of 22 articles were included and four other references from WHO official website and American Academy of Pediatrics were used.

The reports from the articles proved that COVID-19 pandemic affected adolescents including their sleep habits. Some of the authors observed that adolescents slept later in night [3],[4],[5]. Kaditis et al.[6] noticed that 89.8% of teenagers used to go to bed after 10pm on weekdays and there was a significant increase in later sleep hours in weekends. A later waking up in the morning was also stated, although Segre et al. suggested that waking up time remained stable. [3],[4],[6]. Generally most of the authors suggest that the sleep duration increased [3],[7],[8],[9],[10]. In a very interesting study Androutsos et al. underlined that during the lockdown 4.8% of adolescents were sleeping less than 8 hours instead of 15.4% before the quarantine [11]. However, Kaditis et al. stated that sleep duration of adolescents was the same (40%) despite the shifts of bed and wake time [6]. Moreover, Ramos Socarras et al. stated that there was an improvement in self-reported sleeping quality and feeling somnolence in adolescents, presenting no difficulties in falling asleep [5],[3]. Nevertheless, problems were not missed. For example, nocturnal and early morning awakenings were observed.[3],[4] Segre et al. claimed that 28% of adolescents had sleeping difficulties and some of them wanted to sleep with their parents[4],[7],[8]. A considerable correlation of sleep habits with screen time, the perception of flow time' in other words, whether teenagers felt that time passed slow or fast, social-demographic factors and mental health was also reported [3],[4],[5],[6],[8],[9],[10].

As far as screen time is concerned, an increase was observed in hours spent [3],[5],[6],[8],[9],[10],[11],[12],[13]. Segre et al. [4] claimed that 31.7% of adolescents spent more than 2 hours in their free time and 68.3% less than 2 hours. In another study, Al Hourani et al. showed that 70% of adolescents spent more than 3 hours per day in front of a screen [7]. Francisco et al. also observed that before quarantine,

they used to spend less than 1 hour [7],[12] and during the pandemic the use was increased. In addition, in Italy, Portugal and Spain the

The reports from the articles proved that COVID-19 pandemic affected adolescents including their sleep habits. Some of the authors observed that adolescents slept later in night [3],[4],[5]. Kaditis et al. [6] noticed that 89.8% of teenagers used to go to bed after 10pm on weekdays and there was a significant increase in later sleep hours in weekends. A later waking up in the morning was also stated, although Segre et al. suggested that waking up time remained stable. [3],[4],[6]. Generally most of the authors suggest that the sleep duration increased [3],[7],[8],[9],[10]. In a very interesting study Androutsos et al. underlined that during the lockdown 4.8% of adolescents were sleeping less than 8 hours instead of 15.4% before the quarantine [11]. However, Kaditis et al. stated that sleep duration of adolescents was the same (40%) despite the shifts of bed and wake time [6]. Moreover, Ramos Socarras et al. stated that there was an improvement in self-reported sleeping quality and feeling somnolence in adolescents, presenting no difficulties in falling asleep [5],[3]. Nevertheless, problems were not missed. For example, nocturnal and early morning awakenings were observed. [3],[4] Segre et al. claimed that 28% of adolescents had sleeping difficulties and some of them wanted to sleep with their parents [4],[7],[8]. A considerable correlation of sleep habits with screen time, the perception of flow time: in other words, whether teenagers felt that time passed slow or fast, social-demographic factors and mental health was also reported [3],[4],[5],[6],[8],[9],[10].

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was noted [3],[4],[7],[8],[10],[14],[15]. Mastorci et al. described a decrease in exercise, more frequent in boys, whereas, Ali et al. mentioned that 64.2% of females also avoid any kind of exercise [5],[16]. Furthermore, Androutsos et al. claimed that 66.9% of parents observed that the physical activity of their children was declined [11]. Characteristically, Ng et al. stated that 20% of the Irish teenagers took part in their study, had increased their physical activity, 30% had no changes during the pandemic and 50% of them characterized by physical inactivity [17]. Those observations were also confirmed in Al Hourani's et al. study, which found that more than 50% of adolescents did not exercise or exercise for less than an hour [12]. It should be noted that Orgilés et al. emphasized the role of the family relationships, highlighting good family relationships, as an enhancing factor to adolescents exercise [8].

Weight gain during COVID-19 pandemic seemed to be related with physical inactivity [4],[11],[12],[13],[14],[15],[17]. There was a lack of weight control in obese or overweight adolescents during quarantine [15]. Androutsos et al. noted that 35% of adolescents increased their weight due to large consumption of breakfast and salty snacks [11]. Orgilés et al. suggested that during COVID-19 pandemic the prevalence of overweight reduced from 23.3% to 20.7% but prevalence of obesity increased from 12.9% to 16.4% [8]. According to the study of Dondi et al. took place in Italy, weight increased in 31.8%, reduced in 6.4% and remained stable in 61.8% of teenagers [13]. Fernandez-Rio et al. noticed weight loss in adolescents [18]. Moreover, mood changes determined the shifts in weight [13]. Głabska et al. underlined that adolescents thought that health and weight control were of great importance and considered mood or sensory appeal of food to be less attractive [14].

Eating habits have been altered too. For example, food intake raised [12],[18],[19],[20]. Dondi et al. revealed 27.3% increase of food consumption, 12.9% decrease and no changes (59%) concerning food intake [13]. Segre et al. claimed that teenagers consumed different amount of food in comparison with pre-COVID-19 era [4]. Cipolla et al. stated that teenagers with obesity or being overweight increased the consumption of carbohydrates in contrast to vegetables and fruit, while 1/3 consumed more sugar drinks but the number of daily meals remained the same [15]. In addition, Dondi et al. supported that

more teenagers preferred snacks, fruit juices and soft drinks [13]. Two studies described a rise in consumption of vegetables, fruit and fresh fruit juices, with girls to consume more vegetables than boys [11], [19]. Mastorci et al. reported that during the lockdown the adolescents of their study chose Mediterranean diet, however, according to Ruiz-Roso et al. there was an increase of consuming sweets in teenagers, as 20.7% of them ate sweets on daily basis [16],[19]. Especially, adolescents under the age of 14 years old ate a lot of fried food, over 14 years old consumed a lot of vegetables and fruit and over 17 years old had the larger consumption of sweets. Furthermore, concerning the quality of the food, Pietrobelli et al. claimed that increased the consumption of chips, red meat and sugar drinks and in another study was underlined the increased consumption of high calories food, sweets and preference of high perishable food [9],[21]. The literature revealed that due to quarantine, parents remained more time in home and engaged with cooking and leading to better quality of food [11],[15],[20]. Moreover, consumption of fast food reduced, and Ruiz-Roso et al. referred that during pandemic 64% of adolescents ate fast food less than one time per week, instead of 44.6% before COVID-19 era [11],[19].

Concerning the results, COVID-19 pandemic caused negative feelings to adolescents such as psychological distress, anxiety, worry, fear and decline in mental health [4],[7],[8],[15],[16]. Dondi et al. stated that adolescents felt nervous (73.5%) and lonely (68.9%) [13]. Moreover, Mastorci et al. claimed that females were more depressed and had less self-perception than males, while Francisco et al. mentioned that boys faced much more anxiety than girls. It is also interesting that Spanish teenagers evoked behavioral alternations whereas Portuguese appeared mood shift [7],[16]. Stress and dreariness could cause awkward eating patterns led to emotional overeating as some teenagers had the tendency to face their problems with food [15]. However, a minority reported good feelings, hope and calmness [20]. Furthermore, Mastorci et al. referred that adolescents felt more controlled and less independent [16].

The closure of schools, led some teenagers that did not attend online classes to start a hobby and females addressed that time passed very fast [5]. Adolescents avoid attending online lessons because they consider online teaching as ineffective, due to technical difficulties. Moreover, they believed that the the intera-

ction between them and their teachers was limited via distance-based learning [5]. Closed schools, however, induced adolescents' isolation from their peers and their social relationships [7],[8],[16],[20]. Hence, they stayed home and spent a lot of time with their family that led to frequent arguments [5][20]. Ares et al. suggested that 61.8% believed that family cohabitation was easy, while 11.4% thought that was challenging. Although adolescents used the various social media to be informed for COVID-19 pandemic, sometimes seem to fed up with news related to the pandemic [5],[20].

## Discussion

Undoubtedly, COVID-19 pandemic changed adolescents' lifestyle and affected their physical and psychological health. We should also take into consideration that adolescence is a tough period as teenagers experience a lot of changes. An additional alteration that had to cope with is the new everyday reality that has formed due to the restrictive measures of the pandemic.[22] It should be highlighted though, that every person faces this situation with different ways. That is confirmed by the literature concerning the various responds of teenagers about the impact of the pandemic on them. That is because, socio-economical status, demographic and psychological factors played an important role [23]. Generally, adolescents stayed at home, slept more, spent more time playing with digital gadgets and exercised less [8].

Many adolescents altered their sleep habits due to the new everyday lifestyle. Closure of schools led to online classes and therefore, to a more flexible schedule [3],[11]. Hence, the sleep duration increased. In other words, from this aspect, lockdown appeared as a protective factor for the duration of sleep. Characteristically, some adolescents reduced the use of alarm, as they did not have to wake up to early anymore.[5] Moreover, teenagers the more they stayed at home, the more they slept [4][24]. Those who sleep many hours, considered that time passed very fast [5]. Francisco et al. suggest that the mean duration of sleep during the COVID-19 pandemic was 9.51 hours per night and accordant with the suggestive hours of sleep from WHO and American Academy of Sleep Medicine (98-10 hours for adolescents) [7]. Nevertheless, the social distancing and isolation that caused distress and negative feelings in teenagers and later bed time should be examined as they can offset the benefits of longer sleep duration [3],[7]. Moreover, the increased

use of screens and digital gadgets seemed to reduce the duration of sleep and affect the dreams [5],[6],[8]. The dreams can also be affected from family conflicts and arguments and from the high tiredness level of adolescents [5]. Ramos Socarras et al. and Segre et al. did not notice any changes in dreams or nightmares [3],[4]. Regarding the screen use, Kaditis et al. recommended stop using them one hour before sleeping because they may spoil the sleep quality.[6]It should not be omitted that, the screen use has increased so much due to the online conduction of school classes. In addition, another reason is that adolescents spent their spare time with electronic gadgets while they stayed isolated in their home in order to alleviate their boredom [11]. Furthermore, adolescents engaged with a hobby and remain busy during the day did not face insomnia. Ali correlated insomnia with anxiety and depressed, too. Hence, excessive screen use, physical inactivity and poor quality of mental health affected sleeping patterns [5].

COVID-19 pandemic affected more adolescents with poor habits of exercise before the pandemic and those who were overweight or obese [17]. Generally, physical inactivity in combination with the isolation at home, increased screen usage, led to emotional shifts and behavioral changes and related to a tendency of constant food consumption. Weight gain was not only related to less exercise, but correlated with the eating habits of adolescents. It is of high importance to emphasize the crucial role of maintenance normal weight, especially taking into consideration the COVID-19 infection effect. Obese and overweight people are in high risk of severe illness from COVID-19 and complications [11]. Parents and adolescents should be informed about the side effects of obesity and the benefits of healthy diet and physical activity. According to WHO guidelines, [25] adolescents should consume at least five portions of fruit and vegetables daily, fat intake should be less of the 30% of the energy intake and salt consumption should be limited, too. Moreover, the consumption of free sugars should be reduced to less than 10% of total energy intake [25]. Androutsos et al. suggested that attention should be paid not only to measures for the restriction of the pandemic, but importance should be given in measures for prevention and treatment of obesity, too [5]. For instance, surveillance of food advertisements and recommendations for healthy eating habits could help. Moreover, special care should be given to vulnerable populations, among which are adolescents and families

of low socio-economic status. Adams et al. reported that families with low socio-economic status and lack of money, preferred high processed food as they could not afford buying healthy foods [21].

Home environment played also an important role during the COVID-19 pandemic. Segre et al. suggested that adolescents living in cities and in small apartments had reduced physical activity, with consequences in their physical health, mental status and sleeping habits [4],[7]. In contrast, adolescents inhabiting in houses had more opportunities for exercise. In addition, if there was a garden in a house, teenagers had contact with the nature. Neighbors are also important as the interaction of them is considered as a social contact, reducing the feeling of loneliness [6],[7]. During COVID-19 pandemic the members of each family stayed together in the home more time than used to. Hence, there was more time for interaction among them. Having siblings could also improve the well-being and the mental status of adolescents [7]. However, problems were not missed. Parents sometimes appeared stressed and their children seemed to be influenced too. Moreover, arguments and family conflicts were mentioned and seemed to affect their mental health, their eating habits and sleeping patterns [5], [7], [8], [11], [20]. Particular attention should be paid to cases that adolescents are abused or neglected by their family [22]. So, some homes do not allot always a safe environment that ensures the healthy physical and psychological development of the teenagers. The role of parents is significant during this taught time. Francisco et al. recommend that parents should be by the side of their children and explain to them the current situation. The researchers suggested that parents should show their understanding to their children and their concerns and should try to spend their time creatively with the adolescents. That is a way to strengthen the relationships between parents and adolescents. Furthermore, adolescents should be motivated to maintain contact with their peers through technology's possibilities and use rationally electronic gadgets [7]. Moreover, concerning screen use, parents should follow the recommendations of American Academy of Pediatrics (AAP) [26]. In other words, parents should place limits concerning the time spent in front of screens and assure that screen use do not take the place of exercise or sleep of teenagers. Additionally, parents should teach their children not to use screens while they are eating or driving. Last but not least, parents should inform their children about online safety

according to the AAP [26].

### **Conclusion**

COVID-19 pandemic has affected undoubtedly the everyday habits of adolescents such as physical activity, eating and sleeping habits, reading and education. All these changes affected not only the physical health of young adolescents worldwide but also their mental status, social behavior and relationships. Given that the pandemic is still present, yet is unknown when we will return to our previous, normal lives, so, teenagers should be supported and motivated to follow a healthy lifestyle.

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# The relationship between mathematical abilities and phonological awareness skills in Greek students: a cross-sectional study in 1st graders

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## ABSTRACT

**Background:** Available literature and research indicates that phonological awareness is correlated to mathematical abilities. There are, however, little evidence concerning Greek language.

**Purpose:** The purpose of this study is to identify whether there is a relationship between phonological awareness (PA) and mathematical skills in monolingual Greek 1st Graders. Although Greek language differs from English in morphology and phoneme-grapheme correspondence, similar findings are expected as in international literature.

**Method:** The present study assessed 45 children, students of 1st Grade in non-verbal IQ, reading, Rapid Automated Naming (RAN), Phonological Awareness (PA) and mathematical skills.

**Results and conclusions:** Correlation analysis showed that there is a significant correlation between mathematical abilities and PA and RAN. In addition, mathematical skills were correlated to reading abilities and age of the participant. Regression analysis also revealed a correlation between mathematical abilities and PA and RAN.

**Keywords:** *Cognitive Psychology, Mathematical Abilities, Phonological Abilities*

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## Introduction

Mathematical skills develop from an early age [1]. On the other hand, phonological awareness (PA) skills begin to develop at the age of 4, when children begin to be able to identify words that rhyme, and become more sophisticated as children mature [2]. In a similar vein, Greek children develop PA skills in pre-school age, albeit rhyme awareness is not so widely used, as Greek language differs significantly from English language on how words are formed [3].

This study aims to examine the relationship between PA skills and mathematical skills in Greek 1st Graders.

Over the years, numerous studies have indicated that PA is a key factor for developing literacy skills in both shallow and deep orthographies –including Greek [3, 4]. Furthermore, several studies have shown the link between PA skills and numeracy skills [5-7]. Although in several languages, and mainly in English, there is a plethora of research that focuses on the relationship between phonological skills and mathematical abilities [7, 8], and although there are numerous studies examining the link between PA and literacy development in Greek language [3, 9], there is limited research investigating how phonological skills in Greek impact on mathematics. The researcher found only 5 relevant studies (with only two of them examining specifically the association between PA and mathematical skills). The oldest study in Greek, by Porpodas, and Palaiotheodorou[3], investigated whether the training of PA has positive results only in specific domains (i.e. reading and spelling acquisition) or in general student competencies (such as math acquisition). The conclusions suggest that there is no correlation between phonological training and improvement in mathematical competencies.

Furthermore, Manolitsis, Georgiou, & Tziraki [12] found a relationship between early mathematical skills development with home literacy environment. Georgiou, Tziraki, Manolitsis, and Fella [13] examined whether rapid automatized naming is related to both reading and mathematical skill for the same reason (the results of this study underline that, unlikely literacy skills, numeracy skills are not related to a specific component of RAN).

In order to examine the correlation between Mathematical skills and PA skills as well as the existence of an underline mechanism that connects these two abilities 45 monolingual 1st Graders were recruited and assessed by the researcher in Mathematical skills, PA skills, reading fluency, non-verbal IQ and RAN. Age was also examined.

The primary purpose of the present study was to examine the contribution of PA in mathematical skills, and furthermore, to examine what other factors (age, RAN, reading fluency non-verbal IQ) may contribute to mathematical achievement. The researcher chose to assess 1st Graders, since this is the class in Greece that formal teaching starts (same curriculum, detailed aims and objectives for each subject and for each lesson and the same books nationwide), which would provide a homogenous sample. Furthermore, the consensus suggests that PA correlates with simple arithmetic skills, as those in younger children, pre-schoolers or students of 1st Grade [7, 14], but not with more complex mathematical abilities, as those obtained by elder students [7, 15]. Thus 1st Grade is an appropriate age to assess children.

Relying on the previous studies the researcher hypothesizes that there will be a strong correlation among mathematical abilities, PA and RAN. Moderate correlation between mathematics and reading skills is expected, since reading is mostly correlated to advanced mathematical skills, and not simple computations, such those of the math measure of the current study. Furthermore, moderate correlation between mathematics and non-verbal IQ is expected, since previous studies has shown that there is a relationship between those two in 1st Graders [16, 17].

## Methods and Materials

### *Ethical Approval*

This project was approved on ethics ground by the University of Sheffield, Department of Human Communication Sciences, in 12/2/2018.

### *Participants*

For the purpose of the current study typically developing children were sought. A total of 45 monolingual Greek participants (21 males and 24 females, age in months: between 76 and 87 months, mean = 82.33, SD = 3.35) were recruited. All participants were recruited from urban and semi-urban areas –Lefkada, Palairos and Agrinion and all children came from middle socioeconomic backgrounds (based on their place of the residence). The recruitment was done through a local after-school club (Agrinion) or through individuals (Lefkada, Palairos and Agrinion). Consent from the after-school club manager (where necessary) and parental contents were obtained prior to testing.

## **Design and Materials**

### ***Nonverbal IQ***

Wechsler Abbreviated Scale of Intelligence - Second Edition (WASI-II), Matrix Reasoning subtest (2011) [18] was administered to assess nonverbal IQ. In this subtest the examinee views a matrix or series that needs to be completed with one of the given options [19]. Since WASI-II is a culturally based test and it has not been standardized in Greek population, raw scores were used to indicate whether a participant is considered to have typical IQ or not.

### ***Reading***

Detection Test of Reading Difficulties, Syllables subtest and Non-word subtest [20] were used to assess the reading. The Syllables subtest includes 24 syllables in form of CV, VC, CCV, CCCV, CCCVC (C=consonant, V=vowel) in escalating difficulty order, whilst the Non-word subtest includes 24 two-threesyllable or multi-syllable non-words in escalating difficulty order, as well. The children were asked to decode the syllables or the non-words and the test was discontinued after three consecutive false answers.

### ***Rapid Automated Naming***

Children were administered the two subtests taken from [21] “Rapid Automated Naming (RAN) Test”. Each measure included two tasks (an easy one and a more difficult one), RAN Colors (RAN-C) and RAN Digits (RAN-D). In each task, participants were asked to name 20 stimuli as quickly as possible. Originally, participants’ score was the ratio of the total number of items named correctly divided by the total time taken, for each pair of tasks individually (averaged across the two cards) [22]. In this research however, a total score

of the 42 subtasks (2 RAN-C and 2-RAN-D) will be used as it would be more effective in terms of administration.

### ***Phonological Awareness (PA)***

PA was assessed through the “Phoneme Elision Test” [23]. Phoneme Elision Test is part of a larger battery of tests. It is an adaption of Wagner’s et al. (1993) respective test. In this test children are asked to repeat a word after deleting a specific phoneme (vowel or consonant) The remaining phonemes form a real word [24, 25]. The test consists of 15 items.

### ***Math Abilities***

A simple math tasks battery was used. The tasks included: Addition1 (single digit addition, subtraction, group math task, speeded number writing, Addition2 (single and 2-digit number addition with results higher than 10), Addition3 (single and 2-digit number addition with regrouping).

### ***Procedure***

Children were assessed in 1 session, either at school or at home. WASI-II, Reading Test, RAN and PA Test were administered to each participant individually. Math Test was administered either in small groups (3-4 children) or individually.

Each session lasted approximately 25 minutes. Children were told they were going to participate in game. All tests were paper-based.

## **Results**

Descriptive statistics for all individual measures are reported below:

The age of the participants was between 76 and 87 months (mean = 82.33, SD = 3.35), WASI-II score was between 1 and 14 (mean = 6.42, SD = 3.18). Reading Test score was between 0 and 48 (mean = 38.40, SD = 10.70). RAN Score was between 0.55 and 1.73 (mean = 1.15, SD = .26). Phoneme Elision Test score was between 0 and 15 (mean = 8.36, SD = 5.04). Math Score was between 31 and 107 (mean = 59.31, SD = 15.60). In Reading Test 48 was the maximum possible score. In Phoneme Elision Test 15 was the maximum possible score.

### ***Correlational analysis***

Correlation analysis was carried out in order to investigate the relationship between PA skills and

RAN skills.

There is also a significant moderate correlation between reading abilities and both PA skills and RAN skills. There is no correlation between non-verbal IQ and either age, reading abilities, PA skills or math skills. There is, nevertheless, a significant moderate correlation between WASI-II score and RAN score.

### Regression Analysis

Regression analysis was carried out to investigate the contribution of PA skills (i.e. phoneme elision test), non-verbal IQ (i.e. WASI-II), age, reading abilities (i.e. reading test) and RAN skills (i.e. RAN Overall (ratio) in predicting individual differences in maths ability (Table 2). The model accounted for 36.6% ( $F = 4.504$ ,  $p = .002$ , Regression  $df = 5$ , Residual  $df = 39$ ) of the variance of Math Skills. RAN skills was the only predictor that explained a statistically significant unique variance in Math skills, while PA skills may be a predictor of Math skills. The results, however, need to be explained with cautiousness. No other variable can be a predictor of Math skills.

**Table 1**  
Correlations between Age, Non-verbal IQ, Reading Ability, RAN, Phoneme Elision Ability and Math Ability

	AGE (in months)	WAS I-II	Reading Test	RAN Overall (ratio)	Phoneme Elision Test	Math Test Overall
AGE (in months)		.102	.255*	.260*	.243	.292*
WASI-II	.102		-.033	.309*	.134	-.035
Reading Test	.255*	-.033		.370**	.563**	.276*
RAN Overall (ratio)	.260*	.309*	.370**		.539**	.484**
Phoneme Elision Test	.243	.134	.563**	.539**		.486**
Math Test Overall	.292*	-.035	.276*	.484**	.486**	

^. Correlation is significant at the 0.05 level (1-tailed).  
 \*\*. Correlation is significant at the 0.01 level (1-tailed).

**Table 2**  
Simultaneous regression with age, non-Verbal IQ, Reading, RAN Score, Phoneme Elision Test Score and Math (N=45)

Variable	R <sup>2</sup>	Math B	SE B	$\beta$	t
	.366				
AGE (in months)		.753	.626	.162	1.203
WASI-II		-1.035	.669	-.211	-1.548
Reading Test		.137	.232	-.094	-.591
RAN Overall (ratio)		21.801	9.642	.363	2.261*
Phoneme Elision Test		1.028	.531	.332	1.937**

Note:  $F=4.501$ ,  $p=.002$ . B, unstandardized coefficients; SE B, standard error for unstandardized coefficients;  $\beta$ , standardized beta coefficients.  
 \*  $p<.05$   
 \*\*  $p=.06$

## Discussion

The current study aimed to elucidate the predictors of mathematical development. The main objective of the study was to investigate if PA is a predictor of mathematical abilities in Greek-speaking children and if that is true, to examine which other factors contribute to this relationship. Despite the plethora of studies in several languages that confirm the correlation between mathematical abilities and PA [7, 26] and the argument that other factors as well, and especially RAN, can be a predictor of mathematical development [6, 8, 27-29], only a few studies have been conducted in Greek-speaking children. Since differences in the syllable structure and the lexical stress of each language affect the phonological awareness of its speakers –e.g., phoneme awareness is more salient in Greek and English, while syllable awareness is more salient in French and Spanish– [30, 31], it is important to conduct research in various languages in order to examine whether the relationship between PA and mathematical ability is cross-linguistic or it differs from language to language. In this case, it is possible that other factors, or underlining mechanisms –such as RAN or working memory– might facilitate the relationship between PA and mathematical abilities. Furthermore, it was examined the contribution of non-verbal IQ, age, and reading abilities in mathematical abilities, based on findings of previous studies [30, 32, 33].

The results of this research were consistent with previous research. In fact, the study generated two main findings. Firstly, the research replicated core findings of previous studies in other languages [5, 7, 26, 33, 34], as well as in Greek-speaking children of the same age [13], suggesting that individual differences in PA are a strong predictor of mathematical abilities. As previous research has indicated, children's early mathematical skills (such as counting) are strongly related to PA, despite the differences in the structure of different languages [29]. Moreover, the findings were congruent with findings in children with poor phonological awareness and/or low performance in mathematics [34-36], suggesting that deficits in phonological awareness lead to poor academic performance not only in reading, but also in maths.

Secondly, there was a clear interrelationship between RAN, PA, and mathematical skills, confirming previous research [13]. This interrelation may be a

possible explanation for the first finding, since both mathematical skills and PA correlate directly to RAN (for the relationship between maths and RAN see: Swanson, 2006 [27]; Koponen et al., 2007 [6]; for the relationship between PA and RAN see: Papadopoulos et al., 2009 [25]). RAN seemed to be one of the strongest predictors of both mathematical skills and PA. Indeed, research has shown that there is a significant correlation between RAN and mathematical skills, especially regarding arithmetic calculation and math fluency [37].

These findings are very important since they confirmed the existence of a relationship between PA and RAN, and mathematical skills in Greek language, where little research has been done.

Furthermore, there was a correlation between mathematics and reading skills, which, however, was not as strong as between them and RAN, and PA. In fact, only RAN and PA, accounted as predictors of mathematical skills in the simultaneous regression analysis, accounting for 36.6%. This is in line with previous data [5, 14] that suggest the contribution of reading skills in mathematical skills can be explained due to the common phonological influences on both of them. In fact, as it was expected, reading skills were associated with PA. Although the association between PA and both reading and mathematical skills is well-documented the interpretation of these relationships remains unclear. Reading skills were also correlated to RAN, confirming the findings of previous research, which have indicated that RAN pause time was a key component of reading skills during 1st Grade, after controlling for general ability and phonological awareness skills [13]. These correlations, as well as the strong correlation between PA and RAN, might indicate that RAN and PA share common mechanisms. Indeed, some researchers have proposed that RAN is, in fact, the measure of phonological retrieval [38]. Georgiou and his colleagues [39] suggest that RAN indicates how quickly can someone access to both phonological and numerical representations in their long-term memory. While Koponen et al meta-analysis [37] indicate that both math and RAN require quick access to and retrieval of phonological representations from long-term memory. Furthermore, different types of RAN are associated to reading skills and mathematical skills- alphanumeric RANs were stronger predictors of reading skills, while number-

specific RANs were stronger predictors of arithmetic fluency [40].

There is a correlation between age and mathematical skills, which, however, does not apply in simultaneous regression analysis. The weak correlation between math and age, as emerges from regression analysis, might be explained because of the fact that math performance is directly associated to formal education, thus, children of typical development of the same class are expected to score similar results in the maths assessment.

There is no correlation between mathematical abilities and non-verbal IQ. This can be attributed to the fact that the test that was used for measuring non-verbal IQ (WASI) is not standardized in Greek population, and possibly cultural differences might have altered the results. Furthermore, the results were congruent with Moll's et al. findings [41] arguing that non-verbal IQ is correlated to neither counting or number knowledge and do not account for significant variation in early number skills.

The results of the current study are important since they contribute in the international literature, adding information about Greek-speaking population. Practically, this research may contribute to the improvement of the present screening and intervention programs for Greek students.

### **Limitations and Future Directions**

The results of the current research should be considered in light of a few limitations. The sample of the study included only 45 participants due to the researcher's difficulty in recruiting more children. Furthermore, the design of the study was simple and only basic contributors of mathematical skills were assessed. Moreover, regarding mathematical skills only counting, addition and subtraction were assessed, neither problem-solving nor patterns were assessed. due to time limitation, which might have led to a rough estimation of how PA and RAN contribute to mathematical skills. Regarding PA, only one phonological processing task was administered (this of phoneme elision). So, to fully understand the relation between PA and mathematics, it is possible that other, more sophisticated phonological tasks (such as phoneme blending) should be administered.

### **Conclusions**

The present study gave experimental support to the relationship between mathematical skills, and PA and RAN. It is one of the few studies that examine this relationship in Greek children. In terms of theory, these findings can give direction for future studies in Greek-speaking children. Practically, researchers and educators can use these findings in order to create more effective intervention programmes for children with poor performance in mathematics.

Although the findings of this study confirm previous research and add valuable information regarding the predictors of mathematical development in Greek children, further research should be conducted. Longitudinal research, larger sample, different age groups, more sophisticated mathematical skills, and other cognitive skills (such as working memory) across languages varying in orthographic consistency are needed for further investigation.

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# Fertility preservation in ovary pathologies in pediatric patients

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## ABSTRACT

**Purpose:** To study cases with ovarian torsion or ovarian tumors and hemorrhagic cysts and to review those who underwent ovary sparing surgery in a follow up period of 1 month, 3 months and a1 year.

**Methods:** A prospective study of 46 youth and adolescent patients, from 6 to 16 years old, were prospectively studied from October 2015 to October 2020, in a single tertiary care children's hospital. All underwent radical or ovary- sparing operative management, due to ovarian torsion or ovarian tumor/cyst. Statistical analysis was performed with SPSS (ve 24 SPSS Inc., Chicago, IL, USA).

**Results:** Sixteen patients underwent radical surgery, while ovary sparing surgery was performed in thirty three. Overall, 5 were diagnosed with ovarian torsion, 11 with ovarian or fallopian tube torsion due to hemorrhagic cyst or tumor and 30 with ovarian tumor (23 benign and 7 malignant). Benign or malignant etiology was confirmed through biopsy. Ultrasound was used for diagnosis in all patients, while CT scan or MRI only in 18 cases, especially in those with strong indications of tumor pathology. Initial operation was performed laparoscopically in 30% of patients, without any conversion to open surgery. In all patients postoperative ovarian ultrasound imaging was performed 1 and 3 months after surgery. An ultrasound follow-up 12 months postoperatively was performed in 38 patients.

**Conclusion:** Ovarian-sparing operations are safe for ovarian torsion and benign ovarian tumors and conferred successful clinical outcomes of low recurrence and repeated surgery rates. It is also a viable approach in children and young girls in an attempt to preserve future fertility.

**Key words:** *Ovarian torsion;ovarian tumors;ovary sparing surgery*

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## Introduction

Ovarian surgery in children are rare. The most common pediatric cases in need of surgery are ovarian tumors and ovary or fallopian tube torsion. Overall incidence for ovarian tumors in childhood is estimated 2.6/100,000 girls, depending on patient's age and histological characteristics. Ultrasonography can differentiate ovarian tumors from cystic lesions, a benign and asymptomatic condition. In addition, the incidence of ovarian torsion, fallopian tube torsion or both is estimated 5/ 100,000 girls, 1-20 years old. Sometimes, more often in teenage girls, either hemorrhagic cysts or an ovarian mass (both benign or malignant) could cause an ovarian torsion (1), (2).

Regarding contemporary treatment, there has been a change in practice and most pediatric surgeons nowadays prefer ovarian preservation rather than oophorectomy in order to maintain best chance of fertility in subsequent years. In the majority of ovarian torsion cases, even if the appearance of the ovary at the time of detorsion is not the best indicator for parenchymal viability, ovarian preservation has been advocated. In cases of benign ovarian tumors, the prognosis is excellent following tumor resection within clear margins. If a malignant tumor in the ovary is present, a complete resection with a preservation of the unilateral ovary is usually strongly suggested. Nevertheless, there is an incidence of approximately 23% of a metachronous disease occurring in the other ovary (1), (2).

The aim of the present study is to evaluate the clinical symptoms, diagnosis, management and outcome of ovarian torsion and tumors after ovary sparing surgery in pediatric patients.

## Materials and Methods

This is a prospective study over a 5 years period (October 2015- October 2020) in "P. & A. Kyriakou" Children's Hospital. After the institutional review board approval for medical records and pathological slide reviews was obtained, a total of forty six patients, 6 to 16 years old, requiring surgery were included. Their diagnosis varied from ovarian tumors, hemorrhagic ovarian cysts or ovarian and fallopian tube torsion. Patients who did not receive primary treatment or follow-up care at "P. & A. Kyriakou" Children's Hospital were excluded.

Demographic data, patient's history, imaging, operative and histological data were collected, including age, symptoms, physical examination findings, menstrual status, tumor markers, imaging features, operative details (surgical technique and remaining ovarian tissue), biopsy results and follow up ultrasound and relevant clinical data during 1 month, 3 months and 1 year postoperative.

The necessity of surgical management was determined on the basis of disease extent, patient age, and the need to preserve fertility, after thorough preoperative counseling. A surgical procedure could be considered as ovary sparing (fertility sparing) when the uterus and at least part of one ovary were left in situ. Thus, unilateral salpingo-oophorectomy and unilateral ovarian cystectomy with/without contralateral ovarian cystectomy were all defined as fertility sparing surgeries.

Statistical analysis was performed with SPSS (ve 24 SPSS Inc., Chicago, IL, USA). Chi-square test was used to study the relation between categorical variables. All patients were categorized according to age and pathology and further analyzed with similar univariate and multivariate regressions.

## Results

From October 2015 to October 2020, forty six patients, aged 6 to 16 years, met our inclusion criteria and were studied. The cases included 5 ovarian torsions, 10 ovarian and/or fallopian tube torsions due to a hemorrhagic cyst, 15 hemorrhagic cysts bigger than 4-4.5cm in size, 8 unilateral mature teratomas, 1 bilateral teratoma with right ovarian torsion, 5 immature teratomas, 1 serous cystadenoma and 1 granulomatous ovarian tumor (Fig.1,2,3). The average age of girls was 14 +/- 1.5 years (mean age between 6 to 16 years). There were 28 right ovaries with either a torsion, ovarian tumor or hemorrhagic cyst, 15 left ovaries with similar pathologies and 3 bilaterally affected ovaries including 2 mature teratomas and 1 immature teratoma.

Twenty two (43,4%) out of 46 patients (about half of them) were presented as surgical emergencies in the emergency department. All of them the main symptom was acute abdominal pain. Pain that spread into the groin was also mentioned in 82% of the patients, nausea in 70% and vomiting in 89%. Six pat-

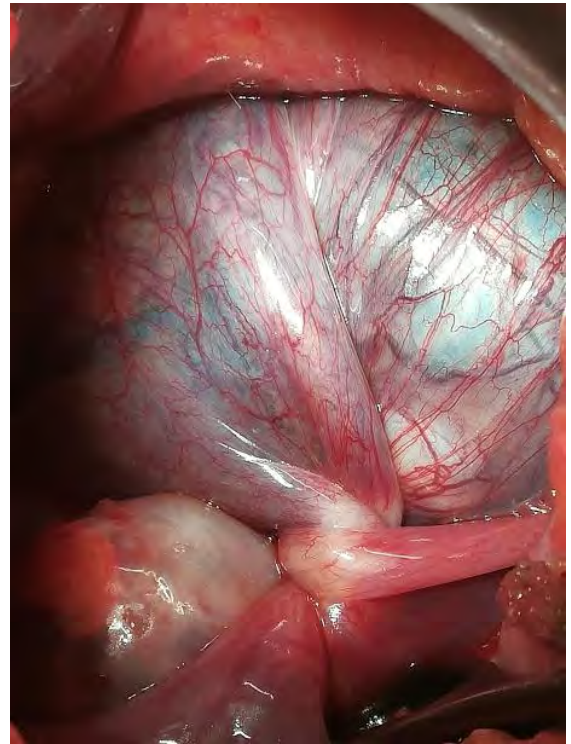
ients reported that they had experienced similar pain in the past. Eighteen patients (39.1%) presented with a palpable abdominal mass or a prominent lower abdomen, without any other symptoms. However, fever  $>38^{\circ}\text{C}$ , as a symptom, was absent during clinical examination.

The diagnosis was obtained in all patients by ultrasound imaging. CT scan or MRI were performed additionally in 18 cases, with indications of tumor presence. Cystic appearance of a mass on ultrasound had a high sensitivity for diagnosis of hemorrhagic cysts, while the presence of solid components increased the suspicion of malignancy and needed further evaluation with CT scan or MRI. In addition, in a case of an ovarian torsion, an increased size of ovaries was seen. However, only in two of them, no blood flow in the ovary was identified in Doppler sonography.

Type of presentation – i.e. whether a patient was presented in the emergency department or not - did not influence the choice of surgery. On the other hand, tumors or cysts were smaller in minimally invasive procedures. Generally, 70% of cases were treated with open procedures and 30% with minimally invasive surgery. None of the laparoscopic operations was converted. Ovaries were removed unilaterally in twelve patients and bilaterally in one patient. Ovary sparing surgery was done in thirty three patients: 11 girls with ovarian torsions with or without hemorrhagic cysts, all girls with hemorrhagic cysts and 7 girls with mature teratoma. In a girl with bilateral mature teratoma, one ovary and two fallopian tubes were preserved. Postoperative complication of superficial and deep/organ surgical site infections, as defined by the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) occurred only in 2 patients.

Blood cancer markers were very helpful in order to decide whether to perform an ovary preserving surgery or not. Cancer markers, such as  $\alpha$ -fetoprotein,  $\beta$ - human chorionic gonadotropin ( $\beta$ -HCG), CEA and CA-125, were examined in all patients. Both  $\alpha$ -fetoprotein and  $\beta$ -HCG were positive only in 4 cases. Positive CEA was found in one girl and positive CEA-125 in two girls. In girls with positive blood cancer markers oophorectomy was performed.

The follow up results of treatment in 38/46 patients were evaluated from 1 month to 1 year. Eight out of 46 patients were operated during the last 10 months. Postoperative ovarian imaging was routinely



**Figure 1:** *Ovarian torsion*



**Figure 2:** *Immature ovarian teratoma*



**Figure 3:** *Mature ovarian teratoma*

scheduled in 1 and 3 months after surgery in all patients. Thirty eight patients were also examined by ultrasound 1 year postoperatively. In patients with previous ovarian torsion, the ovarian tissue structure and function was evaluated as normal. Doppler test revealed also normal ovary blood flow in all of these patients. Only in 2 out of 25 girls with hemorrhagic ovarian cysts, postoperative ultrasound revealed multifollicular ovaries and they were referred to pediatrician for further evaluation. In addition, children with mature teratomas, who underwent ovary sparing surgery seem to have also normal ovarian tissue for their age, without any fertility problems. Two of them are now adults with normal sexual life. Thirty out of thirty three patients who underwent ovary sparing surgery, open or laparoscopic, seem to have 100% functional preservation of ovarian tissue after 1 to 5 years postoperatively.

## Discussion

In the past it was common clinical practice to remove an ischemic (blue-black) ovary without an effort to relieve the torsion or an enlarged ovary in order to avoid leaving part of a malignant tumor. Oophorectomy has been associated with negative long-term consequences. It increases the risk of early menopause and premature ovarian failure, which are associated in adulthood with impaired sexual health, low bone density, neurological and cardiac disease. Increased awareness of these potential negative effects of oophorectomy has led to changes in the management of ovarian pathologies. Nowadays an ovary sparing surgery is performed safely almost always, with satisfactory results regarding the future fertility of young girls (3), (4).

Ovarian detorsion without oophorectomy in the pediatric population was first described in 1985. Ovarian torsion occurs usually secondary to a cystic or solid ovarian mass. In most of the cases the cause is a hemorrhagic cyst, with negative cancer blood markers ( $\alpha$ -fetoprotein,  $\beta$ -HCG, CEA, CA-125), thus ovary sparing surgery should be performed. On the other hand, if malignancy is suspected, a biopsy during the operation must be taken, and, if malignancy is confirmed, oophorectomy must be performed in a second-look operation. Ovaries without malformations account only about 25-68% of the total number of torsion cases. In our study benign tumors that cause an ovarian torsion accounted for 11 of 46 cases, 1 was mature ovarian teratoma, whereas hemorrhagic cysts were 10 and and torsions without any ovarian malformations were only 5

(0.1%). This is consistent with other studies demonstrating that ovarian torsion due to ovarian malignancy is extremely rare, with an estimated incidence of 0,5-8% (2), (3), (5).

Usually, the visual appearance of a twisted ovary, with a grossly enlarged size, dark blue or black color and profound signs of ischemia, should not be taken by the surgeons as a definite prognostic sign for future ovarian functioning failure, if left in place after detorsion. Several studies including large numbers of such cases have demonstrated satisfactory ovarian function on follow-up ultrasound examination. After 4 to 6 weeks ovaries have shown reduced size, normal blood flow and follicle formation. In one of these studies, more than 70% of reviewed ovaries, preserved by detorsion, had visible follicles present on follow up ultrasound. Another study has shown that 4-6 weeks after detorsion a dramatic decrease in volume occurs, as well as increase in blood flow and signs of folliculogenesis both in premenarchial and menarcheal girls seen in ultrasonography. In our patients, an ultrasonography was performed 1 and 3 months after the ovary sparing surgery. A complete functional preservation of ovarian tissue has been proved (2), (5).

The goal of surgical treatment in ovarian neoplasms is cure. However, in children the majority of those are benign. Ovary sparing surgery entails removal of the tumor only, leaving the surrounding normal ovarian tissue in place (oncectomy) or preserving the contralateral ovary, fallopian tube and uterus, considering the potential for fertility as well as the future hormonal health of the young patients. The critical step is to be accurate in preoperative risk stratification that can discriminate between benign and malignant ovarian tumors. Patient history, physical examination, imaging studies such as ultrasonography, computed tomography (CT scan) and MRI could help with preoperative risk stratification. In our study ultrasonography, CT or MRI scan and blood cancer markers were performed in all patients with suspected malignancy. The latter were very helpful in the decision making of performing an ovary preserving surgery or not (3), (6), (7).

Following this strategy in the operating room one could achieve an increase in the fertility rate for children with a history of ovarian teratoma during their adulthood period. The ovarian tissue that remains after the removal of the teratoma, no matter how small it looks macroscopically, contains many viable follicles, capable of hormones production and contribution in the

reproduction process.

Laparoscopic ovarian biopsies performed in girls, 11-34 years old, have proved that each mm<sup>2</sup> of ovarian tissue contains 35 primary ovaries, reinforcing the theory of ovary sparing surgery. The risk of malignancy in the remaining healthy ovarian tissue is very low (0.17-2%). Such rare cases have been reported in women over the age of 40 who underwent surgery at this age for ovarian teratoma. The incidence rate of malignant teratomas in children and adolescents reported in the international literature is very small (1-2%). According to several studies the technique of preserving ovarian tissue can be safely applied in cases of patients with ovarian teratoma who are accidentally found on an imaging test or they present with acute symptoms due to ovarian torsion. In our study 9 girls with mature ovarian teratoma are included, 1 presented with bilateral teratoma and torsion of the right ovary. Both ovaries were preserved in 7 of these cases, whereas in the bilateral teratoma case the right ovary was untwisted and preserved (8), (9), (10).

Ovary sparing surgery is also very important in case of unilateral benign pathology because benign ovarian neoplasms have a 10-23% reported risk for developing a second neoplasm (benign or malignant) in the contralateral ovary. In our group of patients, one child with a right mature ovarian teratoma was referred 14 months after the first successful operation for management of a left sided mature ovarian teratoma. Left ovary sparing surgery was performed (4).

## **Conclusion**

Ovary sparing surgery should be performed by pediatric surgeons in the majority of ovarian torsion cases, following detorsion of affected ovary, regardless of its increased volume or the level of ischemia. The same technique should be used in the management of benign ovarian tumors, where the pediatric surgeon should find the right balance between complete tumor resection and maximal fertility preservation. However, long term follow up is very important, for further evaluation of the ovarian function and possibility of torsion recurrence or a malignancy development in the already affected or the contralateral ovary.

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# Vaccination and knowledge regarding human papilloma virus (HPV) among Greek female adolescents

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## ABSTRACT

**Purpose:** The purpose of this study was to investigate Greek female adolescents' knowledge on human papilloma virus (HPV), vaccine coverage and their attitude towards HPV vaccination, as well as contributing factors such as mother's educational level and last year's grades.

**Methods:** A cross-sectional survey (n=555 girls; mean age=15.1 years) was conducted during the school years 2018-2019 and 2019-2020, using a structured questionnaire, adapted to the needs of the adolescent, which was distributed to the students of participating schools, following the written consent of their parents.

**Results:** Almost 8 out of 10 girls (79.4%) knew about HPV and 44.4% were vaccinated against it. Mean age at vaccination was 13.4 years (SD=±1.5) and in most cases vaccination was done by a pediatrician. Also, 79.3% of the girls that had not been vaccinated against HPV were considering doing so in the near future. Multiple logistic regression showed that knowledge of HPV was significantly associated with last year's grades and mother's educational level. Only mother's educational level was positively significantly associated with vaccination against HPV.

**Conclusions:** In conclusion, although the majority of secondary and high school students had awareness of HPV, vaccination coverage rate was moderate to low despite high occurrence of cervical cancer. Adequate information of adolescents and young adults regarding HPV is a key element in order to take preventive actions or healthy sexual behavior

**Key words:** HPV; Greek female adolescents; vaccination

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## Introduction

Adolescence possesses certain developmental characteristics. Adolescents logic and critical ability are not as developed as emotional capacity (1). In this context, high-risk behaviors often arise both in behavioral matters such as bullying or victimization, as well as in matters of sexuality management and sexualization, body image, eating disorders, and others (1).

Human papilloma virus (HPV) infection is a potential threat for adolescent's health. Many studies support the association between HPV infection and the onset of genital warts, penis cancer and cervical cancer (2-4). Cervical cancer is the most common cancer in young women aged 15 to 44 years, and leads to a significant psychological, social, and financial burden on patients and healthcare systems (5,6). Current estimates indicate that every year 696 women are diagnosed with cervical cancer and 271 die from the disease in Greece (7). Cervical cancer ranks as the 12th most frequent cancer among women in Greece and the 4th most frequent cancer among women between 15 and 44 years of age (7). HPV is high prevalent disease and is easily transmitted through sexual activity (8). Although the majority of girls do not start their sexual activity before the age of 16 years, it is very important to be vaccinated and informed as early as possible (9). The most appropriate time is during early adolescence or early adulthood, when females should be informed about sexually transmitted diseases and be vaccinated in order to protect them in the future (9). The vaccine protects against two types of HPV (HPV-16 and HPV-18) that together cause more than 70% of cases of cervical cancer.10 Moreover, it also protects against the other five carcinogenic types of HPV (31, 33, 45, 52, 58) and the two most common 'low-risk' types, 6 and 11, responsible for 90% of (10). Vaccination against HPV is considered as a revolutionary method of combating HPV, particularly for developing countries, where effective routine gynecological examination is implemented with difficulty. Vaccination is preventive and not therapeutic for HPV infection or diseases associated with HPV (11, 12). Therefore, the HPV vaccine is most useful for girls and women before they become infected with HPV (12).

In Europe, available data from 25 countries showed that HPV vaccination coverage rate in girls was reported  $\geq 71\%$  (high) in ten countries, 51-70% in seven, 31-50% in four, and  $\leq 30\%$  (very low) (13).

There are not available data from Greece.

The purpose of this cross sectional study was to investigate Greek female adolescents' knowledge on human papilloma virus (HPV), vaccine coverage and their attitude towards HPV vaccination, as well as contributing factors such as mother's educational level and last year's grades.

## Material and Methods

### *Study design, sample and settings*

This is a sub-analysis of a cross-sectional survey that was conducted in the context of an educational program entitled: "What happens in adolescence". A self-completed questionnaire was administered in a sample of 1100 secondary and high school students, during the school years 2018-2019 and 2019-2020, in schools of Greek territory. Specifically, schools, whose students were selected to participate in the study, were housed in the following areas: 1) Anavryta, 2) Volos, 3) Elefsina, 4) Ilion, 5) Ioannina, 6) Corfu, 7) Cyclades, 8) Pallini, 9) Piraeus, 10) Tavros, and 11) Chania. The questions of this survey explored habits, experiences and knowledge regarding sex education, body image, adoption of standards in the context of sexualization, behaviors related to use of technology, school bullying and other topics. This questionnaire was used to record data on adolescent behaviors.

### *Construction of the questionnaire*

For the purpose of this survey, a structured questionnaire, adapted to the needs of the adolescent was constructed, which was distributed to the students of schools participating in the study, following the written consent of their parents. In this context, translation and adaptation of various foreign-language questionnaires-research tools were taken place, as shown below. For scales that had not previously been used in Greek populations, a Greek version was constructed employing the back translation method and further modifications were made following a pilot study.

### *Questionnaire structure*

The questionnaire consisted of the following parts:

1. Social-demographic characteristics (gender, age, marital status, parents' profession, ancestry, school performance, etc.).
2. Eating Attitudes Test (EAT 26) (14).

3. Internet usage and behavior data (frequency, place, applications).

4. Bullying – Cyberbullying. These questions were given to the EU-NETADB Pan-European study

5. Young’s Internet Addiction Test (IAT) (15).

6. Smartphone Addiction Scale – Short Version (16).

7. Sexuality and adolescence (self-designed scale) (17).

8. Sexualization (self-designed scale).

9. Strengths and Difficulties Questionnaire (SDQ – Hel) (18).

*The questions concerning HPV were:*

1) “Do you know the HPV virus?”

2a) “Have you been vaccinated against HPV?”

2b) “If YES, at what age were you vaccinated?”

2c) “If you answered YES, which of the following doctors vaccinated you?” (followed by a list of specialties), and

3) “If you haven't been vaccinated, are you thinking of getting vaccinated soon?”

**Implementation of the study**

The implementation of the study included the visit to secondary and high schools that initially expressed their interest in participating in the educational program “What happens in adolescence”. Questionnaires were distributed and completed in one teaching hour. Teachers of participants and collaborators of Adolescent Health Unit (M.H.U.), who were specially trained and approved by the M.H.U. for the implementation of the educational program “What happens in adolescence”, were present during the questionnaire completion.

**Statistical analysis**

Quantitative variables were expressed as mean values (SD), while categorical variables were expressed as absolute and relative frequencies. Student’s t-tests were computed for the comparison of mean values. For the comparison of proportions chi-square tests were used. Logistic regression was used in order to find factors independently associated with knowing about HPV and with being vaccinated against it. Adjusted odds ratios (OR) with 95% confidence intervals (95% CI) were computed from the results of the logistic regression analyses. All reported p values are two-tailed. Statistical significance was set at p<0.05 and analyses were conducted using SPSS statistical software

**Table 1.** Sample characteristics

	N (%)
Age, mean (SD)	15.1 (0.7)
BMI, mean (SD)	20.5 (2.6)
BMI	
Underweight	35 (9.0)
Normal	320 (82.1)
Overweight	31 (7.9)
Obese	4 (1.0)
Born in Greece	526 (95.3)
School grades last year	
<15	58 (10.5)
15-17.9	207 (37.4)
18-20	288 (52.1)
Living condition	
With both parents	458 (83.6)
With one parent	82 (15.0)
Other	8 (1.5)
Father born in Greece	467 (84.8)
Mother born in Greece	459 (83.5)
Working father	501 (93.5)
Working mother	432 (79.4)
One or both parents unemployed	41 (7.5)
Father’s educational level	
Primary/ Middle school	94 (17.7)
High school/ 2 year college	194 (36.5)
University	243 (45.8)
Mother’s educational level	
Primary/ Middle school	58 (10.8)
High school/ 2 year college	172 (31.9)
University	309 (57.3)

**Table 2.** Knowledge and attitude towards HPV

	N (%)
Knows about HPV virus	427 (79.4)
Has been vaccinated against HPV	240 (44.4)
If yes: Age at vaccination, mean (SD)	13.4 (1.5)
Vaccination administered by	
Pediatrician	181 (75.4)
Gynecologist	32 (13.3)
Pathologist / General doctor	16 (6.7)
Do not know	11 (4.6)
If no: Considering being vaccinated in the near future	176 (79.3)

**Table 3.** Univariate analysis of the association between participants’ knowledge of HPV and their sociodemographic characteristics.

	Knowing about HPV virus		P*
	No N (%)	Yes N (%)	
Age, mean (SD)	14.9 (0.6)	15.1 (0.7)	0.002
BMI, mean (SD)	20.8 (2.6)	20.3 (2.6)	0.19
BMI			
Underweight	4 (11.8)	30 (88.2)	0.27
Normal	60 (19.1)	254 (80.9)	
Overweight/ Obese	9 (27.3)	24 (72.7)	
Born in Greece			
No	6 (24.0)	19 (76.0)	0.68
Yes	105 (20.5)	406 (79.5)	
School grades last year			
<15	18 (34.0)	35 (66.0)	<0.001
15-17.9	52 (26.0)	148 (74.0)	
18-20	39 (13.8)	244 (86.2)	
Living condition			
With both parents	94 (21.0)	353 (79.0)	0.39
With one parent	16 (20.3)	63 (79.7)	
Other	0 (0.0)	7 (100.0)	
Father born in Greece			
No	21 (25.3)	62 (74.7)	0.26
Yes	90 (19.9)	363 (80.1)	
Mother born in Greece			
No	24 (27.0)	65 (73.0)	0.11
Yes	87 (19.5)	359 (80.5)	
Working father			
No	10 (29.4)	24 (70.6)	0.185+
Yes	97 (19.9)	390 (80.1)	
Working mother			
No	23 (20.9)	87 (79.1)	0.96
Yes	87 (20.7)	333 (79.3)	
One or both parents unemployed			
No	102 (20.7)	390 (79.3)	0.85
Yes	8 (19.5)	33 (80.5)	
Father’s educational level			
Primary/ Middle school	27 (29.0)	66 (71.0)	0.017
High school/ 2 year college	42 (21.9)	150 (78.1)	
University	36 (15.4)	198 (84.6)	
Mother’s educational level			
Primary/ Middle school	18 (32.1)	38 (67.9)	0.003
High school/ 2 year college	43 (25.6)	125 (74.4)	
University	47 (15.6)	254 (84.4)	

\* p-value from Pearson’s  $\chi^2$  test for categorical variables or Student’s t-test for quantitative variables

## Sample Characteristics

For the purposes of this study, in this sub-analysis we included 555 female students from the total sample of 1100 secondary and high school students. Their characteristics are presented in Table 1. 82.1% of the girls had normal BMI and 95.3% of them were born in Greece. 288 girls (52.1%) had high grades (18-20) during the last year. Also, 83.6% of the girls were living with both of their parents. In 93.5% of the cases, the father was employed, in 79.4% the mother was employed while in 7.5% at least one of the parents was unemployed.

## Results

Almost 8 out of 10 girls (79.4%) knew about HPV (Table 2) and 44.4% had been vaccinated against it. Mean age at vaccination was 13.4 years (SD=1.5) and in most cases vaccination was carried out by a pediatrician. Also, 79.3% of the girls that had not been vaccinated against HPV were considering doing so in the near future.

The percentages of girls who knew about HPV were presented in Table 3 in relation to their sociodemographic data. It was found that girls that knew about HPV were significantly older than girls that did not ( $p = .002$ ). Also, the percentage that knew about HPV increased significantly with higher grades in school and higher parental educational level. Similarly, the percentage of girls that had been vaccinated against HPV increased significantly with higher grades in school and as parental educational level increased (Table 4).

Multiple logistic regression shown that knowledge of HPV was significantly associated with last year's grades and mother's educational level (Table 5). More specifically, girls with high grades last year (18-20) had 3.27 times greater odds of knowing about HPV compared to girls with low grades (<15). Also, as mother's educational level increased, the odds of knowing about HPV increased. Regarding vaccination against HPV, it was found that only mother's educational level was positively significantly associated with it: as mother's educational level increased, the odds of the girl being vaccinated against HPV also increased.

**Table 4.** Univariate analysis results of the association between having been vaccinated against HPV and participants' sociodemographic characteristics.

	Been vacc. against HPV		P*
	No N (%)	Yes N (%)	
Age, mean (SD)	15.1 (0.8)	15.1 (0.7)	0.62
BMI, mean (SD)	20.6 (2.5)	20.3 (2.6)	0.30
BMI			
Underweight	16 (48.5)	17 (51.5)	0.82
Normal	166 (53.0)	147 (47.0)	
Overweight/ Obese	18 (56.3)	14 (43.8)	
Born in Greece			
No	17 (68.0)	8 (32.0)	0.18
Yes	275 (54.5)	230 (45.5)	
Last year grades			
<15	37 (71.2)	15 (28.8)	0.023
15-17.9	110 (56.1)	86 (43.9)	
18-20	144 (50.9)	139 (49.1)	
Living condition			
With both parents	241 (54.3)	203 (45.7)	0.26
With one parent	46 (59.7)	31 (40.3)	
Other	2 (28.6)	5 (71.4)	
Father born in Greece			
No	49 (60.5)	32 (39.5)	0.28
Yes	243 (54.0)	207 (46.0)	
Mother born in Greece			
No	50 (57.5)	37 (42.5)	0.63
Yes	242 (54.6)	201 (45.4)	
Working father			
No	24 (70.6)	10 (29.4)	0.059
Yes	260 (53.9)	222 (46.1)	
Working mother			
No	66 (60.0)	44 (40.0)	0.22
Yes	222 (53.5)	193 (46.5)	
Unemployment in one or both parents			
No	269 (55.2)	218 (44.8)	0.84
Yes	22 (53.7)	19 (46.3)	
Father's educational level			
Primary/ Middle school	53 (58.2)	38 (41.8)	0.086+
High school/ 2 year college	113 (59.8)	76 (40.2)	
University	116 (49.6)	118 (50.4)	
Mother's educational level			
Primary/ Middle school	43 (76.8)	13 (23.2)	<0.001
High school/ 2 year college	99 (59.6)	67 (40.4)	
University	143 (48.0)	155 (52.0)	

\* p-value from Pearson's  $\chi^2$  test for categorical variables or Student's t-test for quantitative variables

**Table 5.** Multiple logistic regression results with knowing about HPV and being vaccinated against it as dependent variables and participants' characteristics as independent variables.

	Know about HPV virus		Being vaccinated against HPV	
	OR (95% CI)*	P	OR (95% CI)*	P
Age	1.41 (0.95 – 2.08)	0.085	0.93 (0.69 – 1.26)	0.637
BMI				
Underweight (reference)	1		1	
Normal	0.51 (0.16 – 1.64)	0.259	0.99 (0.46 – 2.13)	0.975
Overweight/ Obese	0.37 (0.09 – 1.55)	0.173	0.94 (0.32 – 2.73)	0.905
Born in Greece				
No (reference)	1		1	
Yes	0.71 (0.17 – 3.07)	0.648	1.35 (0.39 – 4.61)	0.634
Last year grades				
<15 (reference)	1		1	
15-17.9	1.36 (0.53 – 3.49)	0.520	0.96 (0.39 – 2.35)	0.930
18-20	3.27 (1.25 – 8.55)	0.016	1.13 (0.47 – 2.70)	0.790
Living condition				
With both parents (reference)	1		1	
With one parent	2.22 (0.78 – 6.28)	0.134	1.14 (0.58 – 2.25)	0.703
Other	-	--	4.07 (0.38 – 44.09)	0.249
Father born in Greece				
No (reference)	1		1	
Yes	1.23 (0.38 – 3.91)	0.731	1.22 (0.50 – 2.97)	0.669
Mother born in Greece				
No (reference)	1		1	
Yes	0.82 (0.28 – 2.41)	0.722	0.51 (0.23 – 1.13)	0.097
Working father				
No (reference)	1		1	
Yes	1.17 (0.37 – 3.75)	0.788	0.99 (0.37 – 2.64)	0.983
Working mother				
No (reference)	1		1	
Yes	1.34 (0.65 – 2.76)	0.429	1.47 (0.84 – 2.59)	0.179
Father's educational level	1.13 (0.74 – 1.71)	0.579	0.97 (0.70 – 1.34)	0.834
Mother's educational level	1.67 (1.05 – 2.63)	0.029	1.79 (1.22 – 2.62)	0.003

\* Adjusted Odds Ratio (95% Confidence Interval); -- could not be calculated

## Discussion

The purpose of this study was to investigate Greek female adolescents' knowledge on human papilloma virus (HPV), vaccine coverage and their attitude towards HPV vaccination, as well as contributing factors such as mother's educational level and last year's grades. In our point of view, the most important findings of our study were 1) almost 80% of participants (427) had been informed about the HPV virus and the vaccine against it, 2) 44% of respondents had been vaccinated against HPV, 3) the percentages of girls that knew about HPV and had been vaccinated against HPV increased significantly as mother's educational level increased and 4) girls that knew about HPV were significantly older than girls that did not.

According to international literature, this was the first study in Greece which included secondary and high school female students from a wide geographical area, while the sample of the present survey was much larger than that of a previous study which included only high school female students from Greek islands (555 versus 260, respectively) (19).

In the present study, almost 80% of participants (427) had been informed about the HPV virus and the vaccine against it, a rate higher than this of a previous study conducted in Greek islands (65,5%) (19).

An interesting finding of our survey was that only 44% of respondents had been vaccinated against HPV, rate higher than this of a previous study conducted in Evritania, Greece (5.3%; 10/189) (20). This finding was expected, because in Greece, when the quadrivalent HPV vaccine was included in the National Vaccination Program for girls only, there were many doubts about the efficacy and possible adverse events (20, 21). In studies of adult women in Greece, moderate levels of acceptance of vaccination had been found and the main causes of refusal to vaccinate their female children were the fear of side effects, the lack of information and skepticism about the etiology of cervical cancer (20, 21).

The lack of knowledge about the HPV vaccine among girls and older women may affect their decision to take preventive actions, thus increasing the risk of becoming infected with the virus and developing cervical cancer. It has been found that education and awareness about HPV infection and cervical cancer are essential to improve the level of knowledge and

attitudes of girls and women towards cervical cancer and the diseases caused by the virus (22).

Two interesting findings of this study were that the percentages of girls that knew about HPV and had been vaccinated against HPV increased significantly as mother's educational level increased. These findings were consistent with previous studies conducted in America, where higher maternal educational level was associated with positive attitudes towards HPV vaccination and with more complete information of their female children regarding HPV (23, 24).

Another important finding of this study, which is also consistent with the study of Lai et al. in America, was that girls that knew about HPV were significantly older than girls that did not (25). This may be because older girls, due to the development of sexual activity, are more informed in general about issues relating to sexually transmitted diseases and how they can be protected against them.

One of the strengths of this study is that it included secondary and high school students from areas spread throughout Greece and not only from a particular prefecture. On other hand, its main limitation is that in this kind of survey, in which self-report questionnaire is used, participants may give the answer that is widely accepted and do not answer what they really believe, a phenomenon called socially desirable responding (SDR), leading to response bias (26). Another limitation is that the study contained only three questions concerning HPV, which means that there was no thorough assessment of the level of knowledge about HPV, nor was there an investigation of the reasons why the schoolgirls have not been vaccinated. Finally, another limitation is that, unlike the previous Greek study (19), Greek male teenagers were not included in the present study, although the issue of HPV prevention concerns them. This limitation supports the need to design and implement studies that will include both Greek male and female teenagers in order to detect possible differences between them regarding level of awareness of HPV and vaccination coverage rates.

In conclusion, although the majority of secondary and high school students had awareness of HPV, vaccination coverage rate was moderate to low despite high occurrence of cervical cancer. Adequate

information of adolescents and young adults regarding HPV is a key element in order to take preventive actions or healthy sexual behavior. Therefore, health education, social policy legislative measures, screening, and vaccinations are particularly important in the prevention of transmission of HPV.

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# Substance use by an adolescent with a history of childhood cancer: the role of counseling in risk management

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## ABSTRACT

**Background:** Childhood cancer survivors may have a tendency to risk-taking. Adolescents with a history of childhood cancer experience psychological and neurocognitive long-term effects that also impact negatively their social life. Adolescents are exposed to many risk factors in order to be socially accepted, such as drug use, alcohol use, as well as provocative behavior at school and in the wider social environment. Therefore, the counseling process is vital, to cope with the negative effects of the disease and ensure a positive adjustment in adulthood.

**Case Report:** The present case study is focused on an adolescent male with a history of childhood cancer (acute lymphoblastic leukemia) who suffered cognitive effects on his memory that resulted in poor school performance and stress and reported cannabis use. The counseling intervention was based on the combination of cognitive-behavioral and systemic approach, and family counseling, with the aim to enhance the adolescent's socialization through psychosocial interventions. The duration of the counseling was seventeen sessions. The results of the intervention showed that the initial goal of the student was achieved, i.e. to socialize with his peers and to give up substance use. At the same time, the adolescent discovered many hidden aspects of himself, learned to trust, to communicate without fear and shame, to set limits in the relationships with his family and to claim his rights. The psychological, emotional and moral support of childhood cancer survivors by mental health professionals is important, even years after treatment, to ensure adolescent smooth personal development and social integration.

**Key Words:** *counseling; adolescence, childhood cancer, survivors; substance use, cannabis; drug; addiction; acute lymphoblastic leukemia; cognitive effects; school performance; stress*

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## Background

During adolescence, the feeling of loneliness derives from social difficulties, such as rejection, low school performance, adjustment problems, socio-economic level of the family, lack of social skills, low acceptance of peers, family conflicts and communication through social networks [1-6]. Adolescents with physical illnesses, such as childhood cancer, have experienced similar conditions [7,8]. According to research, most people who experienced loneliness and have survived a life-threatening illness have used substances such as alcohol and cannabis [9,10].

The counseling of adolescents with a history of childhood cancer focuses on five areas [11]: a) information, b) practical and functional issues related to cancer, c) emotional issues, d) interpersonal issues, and e) existential and spiritual issues. Regarding the therapeutic interventions, they can be performed as follows: a) individually, b) with multidimensional family therapy and c) with psychosocial interventions [11, 12, 13].

Personalized intervention model involves three approaches [12,13]: a) the behavioral approach: it aims to help adolescents identify the triggering factors of high-risk behaviors, such as cannabis use, and develop skills and behavioral management techniques in order to avoid and reduce the current use, b) the cognitive-behavioral approach: it focuses on identifying and changing distorted thoughts and dysfunctional perceptions that lead to problematic behaviors, c) the individual activation approach: it encourages adolescents to recognize the fact of doing drugs and develop an inner motivation to change their behavior. According to the third approach, the sessions are grouped into three phases [15, 16]. In the first phase, the first four sessions are held with the aim of enhancing the adolescent's motivation to engage in treatment. The second phase includes six more sessions with the aim of developing skills in order to adopt the social attitude and behavior the adolescent desires. Finally, in the third phase, the treatment focuses on maintaining the desired behavior indirectly. Other, psychosocial interventions in adolescents include [11, 14]: a) peer counseling, b) technology-based interventions and c) skills-based interventions. According to Spence (2003) [17], the cognitive-behavioral model for social skills training constitutes a multi-modal model for adolescent's

social inclusion. The above model includes: a) social skills training through cognitive-behavioral techniques, b) social perception skills training c) techniques of self-regulation, d) the solution of social problems and e) the reduction of undesired behaviors. Based on the cognitive-behavioral approach, the social learning mechanisms for the acquisition of social skills are (Hansen, Nangle, & Meyer, 1998): a) learning through observation, b) the consequences associated with social behavior, c) the feedback of the counselor directly or indirectly and c) the cognitive restructuring of the individual, which is achieved through self-declarations and daily practices for the manifestation of the desired behavior. According to Hansen et al. (1998), the categories of strategic social skills are: a) the utilization of the functional conditions of the individual's life, b) the learning process, individualized and differentiated to the needs of the individual, c) the integration of the functional elements of individual's personality in the counseling process to achieve the generalization of the desired behavior and d) the utilization of external factors.

The multisystem approach is also considered appropriate for counseling adolescents with chronic diseases [19]. To obtain concrete results, the family should be involved in both child support and counseling processes [20]. The multisystem approach is based on the assumption that the child's/adolescent's development and behavior are influenced by four basic concentric systems/environments, centered. The Microsystem, the Mesosystem, the Exosystem and the Macrosystem. In this way, the individual is treated as a member of the system who constantly interacts with the other members of the system. The concept of Chronosystem, i.e. the time factor and the changes that take place during life, was later introduced in the model [19].

## Case Presentation

A.K. was a 17 year-old adolescent, of Greek origin, student in the last grade of high school (Lyceum) who lived in Athens with his parents and his younger brother. The relationship with his parents was characterized by emotional tensions and lack of communication. Concerning his social transactions, he encountered great difficulty in developing friendships or other kind of relationships. He spent many hours on the Internet and rarely interacted with friends or class-

mates. In addition, he reported occasional cannabis use with his classmates. Regarding his medical history, during the 5th grade of primary school he was diagnosed with childhood cancer (acute lymphoblastic leukemia). He had undergone chemotherapy for eight months at the AHEPA Hospital of Thessaloniki. Since then, he had no relapses and was followed-up medically every six months. However, he had suffered cognitive effects that resulted in memory problems poor school performance and high levels of stress. In general, he was characterized by introversion, low self-esteem, strong addiction to the computer and intense feelings of loneliness. He presented at the Center for Adolescent Medicine & UNESCO Chair on Adolescent Health Care at the "Aghia Sophia" Children's Hospital, accompanied by his father, with a basic request to strengthen and empower socialization with his peers.

### **Counseling Intervention**

The counseling intervention focused mainly on the training of social skills with the aim of strengthening A.K's socialization. The intervention was based on a combination of the cognitive-behavioral approach and the systematic approach techniques. In the case of A.K, an individualized intervention was carried out to help him reduce and abstain from cannabis use as well as to reduce intercourse with peers who used cannabis. Based on the treatment model of Hendriks, van der Schee and Blanken (2011) [15], the first intervention phase was not implemented in the adolescent, as it had been carried out during the first sessions. Therefore, there was a combination of the next two phases for a small number of sessions [4], as he was not a regular user. The treatment focused on his belief and positive attitude towards drugs as well as on his delinquent behavior. Subsequently, several cognitive-behavioral techniques were utilized [17, 21], such as instructions, discussion, role-playing and painting, which functioned therapeutically, so that the adolescent could explore himself and identify the conditions and factors that made it difficult for him to engage in social relationships.

During the sessions, free subject painting in the "here and now" was deemed necessary so that the adolescent could not only relate the past to the present, but also develop verbal communication. The

discussion, often enhanced with exercises (such as use of diary, image processing, Internet research, creation of timetable, management of emotional changes), and the whole counseling process aimed at developing his social and communication skills with peers. For example, with role-playing he managed to balance the relationship with his mother, while with relaxation exercises, he managed to limit stress. For the management and abstention of cannabis use, various cognitive-behavioral techniques were used [22] in the context of psychoeducation, such as: information about the negative effects of drugs, information with reliable written texts about legal sanctions both against the individual and his family regarding the drug trade, the processing of images about drug addicts, the Internet search by himself for the negative effects and their presentation during the session, the written exercise on his attitude towards drugs, the handling of safety behaviors by socializing with friends who did not use cannabis, direct verbal reinforcement to achieve desired behavior, and family therapy aimed at support within the family context. At the same time the adolescent's functional conditions and environmental factors were utilized to integrate the functional elements of his personality in the treatment, so that he could develop his social and communication skills.

The sectors utilized in A.K's counseling were the interpersonal issues concerning the supportive role of his family, the impact of chemotherapy on his school performance, the difficulty in developing friendships and other kind of relationships with his peers, the difficulty in revealing his history of childhood cancer and expressing his feelings for that period. In addition, the existential issues concerning the image he had about drugs in relation to chemotherapy were discussed. He was convinced that "after enduring the pain of chemotherapy and not dying of childhood cancer, he will not die of drugs". This exercise was useful and provided a lot of information, which were utilized in two sessions. The first session focused on the adolescent's relationships with family members and the second on his friends from various social backgrounds, in order to improve and enhance his social interactions.

After the completion of the counseling process, A.K managed to focus on strengthening his social skills instead of being led to harmful behaviors, improving his social relationships, changing his beliefs about

cancer and realizing that he is not invulnerable. The ultimate goal was for A.K to respond more realistically to demanding situations, manage the challenges of society and maintain his self-confidence.

The psychological, emotional and moral support of childhood cancer survivors by mental health professionals is important, even years after treatment, to ensure adolescent smooth personal development and social integration.

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# Precocious menarche in a 9 years old girl due to autonomous ovarian cyst treated with letrozole.

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## ABSTRACT

**Background:** Peripheral precocious puberty (PPP) is defined as the early pubertal maturation independent of gonadotropin stimulation. Autonomous ovarian cysts can be a cause of PPP or isolated precocious menarche. The differential diagnosis of ovarian cysts is important because of distinct management options.

**Case presentaion:** A 9 7/12-year-old girl presented because of rapid evolution of breast development and premature menarche. Estrogen levels were elevated while GnRH stimulation test revealed a blunt response. Pelvic sonogram demonstrated an ovarian cyst. She was started on oral letrozole. There was no further episode of menstruation. The cyst resolved spontaneously after three months.

**Conclusion:** Functional ovarian cysts usually regress spontaneously. This case highlights the effectiveness of letrozole therapy in promptly decreasing estrogen levels and immediately controlling menstrual bleeding.

**Key Words:** *pubertal development;precocious puberty;precocious menarche;ovarian cyst;letrozole*

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## Introduction

Puberty is characterized by a series of maturational events leading to the attainment of adult reproductive capacity [1]. The definition of precocious puberty is the appearance of secondary sex characteristics before the age of 8 years in girls and 9.5 years in boys [1]. The incidence of precocious puberty is estimated between 1:5000 and 1:10000, with prevalence 10 times higher in girls [1, 2]. Isolated premature menarche is the apparition of menstrual like bleeding in prepubertal girls in the absence of secondary sex characteristics, usually before the age of 10 [1, 3, 4].

Small ovarian cysts are commonly seen in prepubertal children and are clinically insignificant [2]. Autonomous ovarian cysts are usually benign single cysts that function autonomously and produce estrogens [2]. They can lead to peripheral precocious puberty (PPP) or isolated metrorrhagia with inconsistent response to the gonadotropin releasing hormone (GnRH) test [1-3]. Autonomous ovarian cysts may develop at any age, but their mechanism of production is unknown [2]. They usually regress spontaneously after a few weeks or months, yet they have an important chance of recurrence [2].

The aim of this paper is to report a case of rapidly evolving puberty and premature menarche in a nine-and-a-half-year-old girl that turned to be secondary to a functional ovarian cyst that was managed with oral letrozole.

## Case Presentation

A 9 7/12-year-old girl was referred to the endocrine department because of breast development that was noticed 2 months earlier and vaginal bleeding that occurred in the last 24 hours. She was born prematurely at 35 weeks of gestation and at the age of 7 years, she presented with idiopathic premature pubarche (pubic hair: Tanner 2) for which she was followed in the endocrine department every 6 months. The hormonal evaluation at the initial exam was within normal range and her bone age was 7 10/12. Two months prior to the symptomatology her hormonal profile was prepubertal (Table 1).

Her family medical history was unremarkable except for a history of polycystic ovary syndrome (PCOS) for her mother.

At the time she presented after menarche, her clinical examination revealed signs of breast development (Tanner 2- 3), axillary hair (Tanner 2) and pubic hair (Tanner 2- 3). Her external genitalia and clitoris were normal. Her weight and height measured in the 75th-90th percentile and 50th- 75th percentile, respectively, without an accelerated height velocity (Fig 1).

No signs of McCune-Albright syndrome (MAS), including café-au-lait skin pigmentation and bone deformity were identified on physical examination. Systemic examination was normal. The patient's bone age was 10 years and 6 months and the basal estradiol level was 2021.69 pg/ml (normal < 10 pg/ml), testosterone level was 45.4 ng/dl (normal < 0.1 ng/dl) and 17 OHP was 2.08 ng/ml (normal 0.5-2 ng/ml). The initial ultrasonographic study of the patient's abdomen and pelvis revealed a simple cyst of the left ovary measuring 5.63 × 4.09 × 4.67 cm. The uterus was enlarged with a length of 6.24 cm (normal ≤ 3 cm -Fig 2).

Hormonal analysis revealed suppressed baseline LH and FSH levels (LH <0.10 mIU/ml [during puberty > 0.5], FSH, 0.23 mIU/ml [during puberty > 4]). Serum gonadotropin responses to GnRH stimulation were suppressed. TSH, prolactin, beta human chorionic gonadotropin (β-HCG), and alpha fetoprotein (AFP) were all within normal range. We administered oral letrozole, at a dose of 2.5mg per day, once daily. Treatment was well tolerated and was continued for 3 months. Two months later, the patient remained asymptomatic, and there was no other episode of vaginal bleeding. Hormonal analysis demonstrated a decrease in estradiol levels that became undetectable (< 5 pg/ml). FSH baseline level was 5.35 mIU/ml and LH 0.18 mIU/ml. On ultrasound, the ovarian cyst completely regressed. Therapy was discontinued and there was no relapse of the cyst. One year later, at the age of 10 9/12 years, puberty was evolving normally (breast development: Tanner 3, axillary hair: Tanner 2-3 and pubic hair: Tanner 3). Letrozole was helpful in decreasing estrogen levels faster and possibly preventing another menstrual cycle and bone maturation. The natural history of simple ovarian cysts is spontaneous regression but the use of an aromatase inhibitor may decrease the number of menstrual cycles prior to cyst resolution and thus eliminate psychological stress and prevent bone maturation.

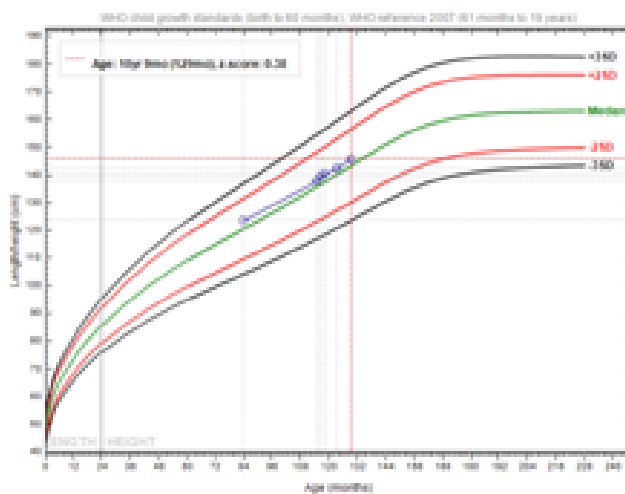
**Discussion**

Precocious puberty can be classified as central (or true), when there is early activation of pulsatile GnRH secretion and peripheral (or pseudopuberty), which is GnRH independent [1, 2]. The vast majority of cases with precocious puberty are because of central precocious puberty (CPP) and a small percentage is due to PPP [1]. PPP is caused by the peripheral production of sex steroids independent of gonadotropin stimulation [1].

**Table: Laboratory data of the patient**

	Two months prior to diagnosis	At Diagnosis	Normal Range
FSH (mIU/ml)	3.38	0.23	Tanner II: 0.5-7
LH (mIU/ml)	0.1	<0.1	Tanner II: <4
Testosterone (ng/dl)	0.14	45.4	Tanner II <0.3
Estradiol (pg/ml)	9.22	2021.69	<10
DHEA-S (mg/dl)	110.5	103	95-1360
Prolactin (ng/ml)	11.6		2-25
TSH (mIU/ml)	6.16	1.85	0.66-4.9
FT4 (ng/dl)	0.86	1.11	1-1.7
17 OHP (ng/ml)		2.08	Tanner I/II: 0.5-2

FSH: Follicle stimulating hormone; LH: Luteinizing hormone; DHEA-S: Dehydroepiandrosterone sulfate; TSH: Thyroid-stimulating hormone; FT4: Free thyroxin; 17 OHP: 17-hydroxyprogesterone



**Figure 1:** Growth chart of the patient



**Figure 2:** Pelvic ultrasound a. Uterus; b. Ovarian cyst

Symptomatology can range from breast enlargement, axillary and pubic hair development, changes of external genitalia, vaginal discharge or even bleeding [1, 3]. In normal puberty, uterine bleeding usually occurs at breast Tanner stage 3-4, 2-2.5 years after the first sign of breast enlargement [3]. A discordant pubertal development suggests peripheral causes of precocious puberty such as ovarian follicular cysts, MAS, estrogen secreting ovarian or adrenal tumors and exposure to estrogenic endocrine disrupting chemicals or contact with estrogen containing creams [1, 3].

Autonomous ovarian cysts produce estrogens independently of GnRH stimulation and may lead to PPP [2]. Possible consequences of a functional ovarian cyst are the acceleration of growth and skeletal maturation leading to premature epiphyseal closure and a decrease of final adult height [1]. The diagnosis of PPP due to an autonomous ovarian cyst will demand a careful and detailed history and clinical examination of the patient, laboratory exams with tumor markers and imaging [1]. The hormonal profile usually consists of elevated estrogen levels with low or undetectable basal levels of FSH and LH [1]. A GnRH stimulation test will show a prepubertal or even suppressed response [1, 3]. This test will help us differentiate PPP from CPP leading to a different therapeutic management.

Radiological investigation with a left hand x ray and a pelvic ultrasound will provide useful information for the differential diagnosis [1]. Diagnosis of functional ovarian cysts is done with a pelvic ultrasound showing one or more large, unilateral, or bilateral ovarian cyst [2]. According to bibliography an ovarian cyst associated with precocious puberty is generally larger than 20 mm [2].

MAS is a rare cause of PPP caused by post zygotic somatic activating mutations in the GNAS1 gene [5, 6]. Classic triad of MAS is precocious puberty, fibrous dysplasia of bones and café au lait macules with irregular borders (coast of Maine) [5]. Other endocrine manifestations are GH excess, hypercortisolemia, hyperprolactinemia, hyperthyroidism, and hypophosphatemia [1, 5]. Girls with MAS sometimes present with autonomous functional ovarian cysts [5, 7].

Gonadal and adrenal tumors are infrequent causes of PPP [1]. Different subtypes associated with endocrine manifestations are germ cell tumors, sex cord stromal cell tumors and adrenocortical tumors [5]. B-HCG and AFP levels may be elevated in gonadal tumors [5]. When completely surgically resected, they have an

excellent prognosis [5].

Management of autonomous ovarian cysts in prepubertal girls can be conservative or surgical [2, 7]. A simple follow up is preferred as the first choice, as most cysts will regress spontaneously, and pubertal signs will also regress [2, 8, 9]. If they persist beyond 4- 6 weeks or present recurrences, a medical treatment with third generation aromatase inhibitors (anastrozole, letrozole) daily is suggested [5]. Other pharmacological agents used in girls with MAS are cryproterone acetate (antiandrogen), tamoxifen (estrogen receptor modulator) and fulvestrant (estrogen receptor antagonist) [5, 7]. According to the literature, there is an important chance of recurrence [2, 8, 9]. Surgical removal of cysts is indicated in cases of torsion or hemorrhage or where there is an increased suspicion for malignancy [2, 8, 9].

In a review of the literature by Papanikolaou et al, most cases of autonomous ovarian cysts with a simple follow up regressed spontaneously (11 out of 13), within a period of six weeks. Nine of thirteen girls managed conservatively presented with recurrences within a median time of 13.5 months. Three out of twenty six cases progressed to CPP [2].

In conclusion, the patient did not present with premature puberty but rather with a rapidly evolving puberty which progressed to premature menarche as early as 2 months after thelarche. Precocious puberty is usually of central origin, but in the differential diagnosis peripheral causes, like ovarian cysts, should always be considered. The patient will need a prolonged follow up during her puberty.

### **Abbreviations**

*17 OHP: 17-hydroxyprogesterone*

*AFP: Alpha fetoprotein*

*B- HCG: Beta human chorionic gonadotropin*

*CPP: Central precocious puberty*

*DHEA-S: Dehydroepiandrosterone sulfate*

*FSH: Follicle stimulating hormone*

*GnRH: Gonadotropin- releasing hormone*

*LH: Luteinizing hormone*

*MAS: McCune-Albright syndrome*

*PCOS: polycystic ovary syndrome*

*PPP: Peripheral precocious puberty*

*TSH: Thyroid-stimulating hormone*

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