



Educational intervention concerning vaccination In Greek pre-adolescents: a study protocol

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ABSTRACT

Objective: Vaccines stand as a cornerstone of modern medicine, pivotal in bolstering public health. However, skepticism and controversy have led to declining public confidence, contributing to suboptimal vaccination rates, particularly among Greek adolescents. The study presents a comprehensive educational intervention targeting pre-adolescents and their parents, encompassing both hard copy and web-based community materials.

Method: 125 pre-adolescents-parents recruited from 7 primary schools in Athens. Questioners were used in two phases, before and after the intervention. Intervention used brochures, website content, youth involvement, parent academies, and peer discussions in order to seek to fortify beliefs in vaccinations and elevate immunization rates. The study also delved into socio-economic factors influencing vaccination uptake and was approved by the Ministry of Education of Greece.

Results: Preliminary findings underscore the significance of Greek nationality and parental employment in vaccine compliance. The study aims to bridge gaps in vaccination knowledge and uptake, laying a foundation for future public health initiatives.

Conclusion: The adolescent vaccination intervention program was well received by the parents of the participating children. The students showed great interest in the subject of vaccinations and their willingness to get involved in matters concerning their health was evident. Students who attended the intervention reported that they are positive about completing their immunizations with the adolescent vaccines, according to the National Child and Adolescent Immunization Program.

Key Words: *adolescence, vaccination, school-based intervention program*

Introduction

Vaccines are considered to be one of the greatest achievements of medical science, a fundamental factor of our public health system (1). Impressive outcomes of vaccine intervention have been incidence reduction of potentially severe infectious diseases in immunized population, but also the result of herd-immunity, the ability to indirectly protect non-vaccinated individuals against infections (1,2). According to WHO, more than 20 life-threatening diseases and 3.5 - 5 million deaths can be prevented due to vaccines. Yet, due to COVID-19 pandemic vaccination rates were extremely low, with 25 million children missing out on vaccination in 2021 (3). Nevertheless, vaccines have always been a field of controversy and skepticism, leading in a decline in public confidence. Lately, anti-vaccination movement effects, have unfortunately resulted to the reappearance of certain «left behind» illnesses (1). Vaccination rates for measles, mumps and rubella, diphtheria, tetanus, pertussis and polio have decreased in many countries (1,2,4). According to a Greek study conducted in Patras 2020 (n=1227) approximately one-third of parents (33.5%) believed that may be a relationship between vaccines and autism (5). Doubts about new vaccines were expressed by parents in another Greek survey, in which approximately 30.4% were confused because of contradictory physicians' opinion and 60.3% believed that economic profit was the reason that new vaccines were developed (6). In order to maintain the full potential of national vaccination programs, health care providers can be willing to inform, create awareness, discuss with the community and also develop youth information channels (7,8). In Greece, the compliance with vaccination national recommendations in adolescence has not yet been sufficiently registered. According to a study conducted by the Adolescent Health Unit in 2011 (9), lower rates were shown for the booster dose of tetanus/diphtheria/pertussis (39.6%) and among girls for the human papillomavirus vaccine (11.9%). Only 22.7% of study participants were fully vaccinated according to criteria employed. Additionally, the vaccination rate for meningococcal serogroup C (Men C) was significantly higher for pre-adolescents, compared to children aged over 14 years old. According to a limited number of studies, the vaccination rate in Greek adolescents is considered to be suboptimal, thus an informative model in this group along with better documentation is clearly needed. Socioeconomic factors seem to play a key role in vaccination coverage. More specifically according to

a number of studies, Greek nationality and older age range of the parent were associated with higher vaccination uptake (5,10). A multiple logistic regression analysis, showed that parents being employed and of Greek nationality were elements having a relation with PCV vaccination uptake with four doses. A multiple linear regression analysis indicated that lack of employment and Greek nationality were elements that affected the total number of PCV doses given (10). According to a study conducted in Patras in 2020, 44% of the study participants believe that unvaccinated children could attend school whereas 56% support the opposite view. A further comparative was performed between these two parental groups (Chi-Square test) and was found that Greek parents versus non-Greek ($p = .013$) and those living in urban area versus semi-urban area of Patras ($p = .04$) were more likely to believe that unvaccinated children should not attend school (5). There is evidence in the available literature that school-based interventions generally increase adolescent vaccination rates (1). Most practice- and community-based interventions have only addressed to HPV vaccination (7,8,11) influenza (12,13). Although public health benefits of immunizing adolescents should be well known, recent measles outbreaks, vaccine refusals and anti-vaccination movement have increased the need of immunization information systems and additional research (14,15). According to the available literature, strategies which have led to improvement of vaccination rates are provider feedback, immunization information systems and school-based immunization programs (14,16). A recent cohort study in Texas, USA involving 2307 middle school students, showed that school with vaccination events and community-based education had a higher adolescent HPV vaccination rate compared to schools that received community-based education only (11).

The goal of the present intervention was to develop hard copy and internet web community-based material for pre-adolescents and their parents, concerning vaccination and prevention of infectious diseases. The intervention included brochures, website material, youth participation, parent academy and meetings with peer-to-peer material and relevant discussions. To our knowledge this has been the first time a school educational program concerning all vaccines of adolescent applied in Greece. Until now, only programs about HPV and influenza exist especially in certain countries (1,8,9,11-13). These studies have recorded increase in vaccination rates after the educational programs. Our goal was to investigate whether such an intervention would lead to a general increase in all vaccination rates and would improve and enrich family knowledge and beliefs in vaccines.

Material and methods

The first component of our study was to investigate the level of information on vaccinations in pre-adolescent's and their parents from seven public schools (125 pupils and their parents). For this purpose, parents were asked to fill a pre-intervention relevant questionnaire, and to provide personal vaccination booklet information. All parents were asked to written consent before intervention starting point.

The intervention performed after pre-questionnaire testing and parent consent to the program. Our main purpose was to develop an information community-based educational model about the importance of vaccinations in adolescents that will enhance their beliefs in vaccines and elevate the immunization rates amongst teenagers. Intervention included brochures, website material, youth participation, parent academy and meetings with peer-to-peer material and relevant discussions. There were also contests and student awards which gave a lot of motivation to teens, being concrete thinkers and living on present tense. Intervention was based on vaccination timeline suggested by the National Vaccination Program- vaccines against meningococcal disease (subtypes A, C, Y, W-135 and B), influenza, diphtheria, tetanus, pertussis and HPV) - and included real life scenarios, multimedia and role-playing material, under the guidance of experienced and specially trained personnel. Parents of neighbor schools were served as a control group and were not bene subjected to educational material, only vaccination registry.

The second phase of the study took place one year later, when the parents that received, the intervention were asked to fill a second form, concerning the vaccination status of their children afterwards, in order to examine the impact of the intervention of this informative model on the vaccination status of their children.

Finally, all the questionnaires and forms subjected to statistical analysis. Demographic data will be collected, including sex and age. All data collected from the questionnaires before and after the intervention and data that emerged between intervention and control-group schools, were compared using chi-square tests and their means using t-tests. Vaccination completion rates at baseline and at follow-up dates were stratified by intervention group and sex and were compared using t-tests. We estimated the statistical difference in vaccination rate between the comparison schools ($p < 0.05$) after the intervention. Logistic regression was calculated for vaccine uptake to test for differences in odds of vaccination rates between the intervention and comparison schools.

The dependent variables in the statistical analysis models included indicators for adolescents who initiated or completed their vaccinations after our program's first period. The independent variables included whether the student is from the intervention or comparison schools and pupils' age and sex.

Results

The questionnaires from the first phase showed that more than 90% of the participants had completed the required childhood vaccinations for the following diseases: tetanus-pertussis-diphtheria (91.2%), chickenpox (92.44%), measles (96.95%), hepatitis A (93.49%) and hepatitis B (92.31%). A lower percentage was recorded for the completion of polio vaccinations (91.2%) and meningitis B (83.72%), while only 56.76% had completed vaccination for meningitis C (3rd dose). Regarding the repeat dose for tetanus-pertussis-diphtheria carried out at puberty (11-12 years) and for vaccination for meningococcal A, C, Y, W-135 (11-12 years), the rates were quite low, namely: Tdap 52.38% and meningococcal A, C, Y, W-135 (71.43%).

A small percentage of respondents had also received HPV vaccinations - 1st dose 8.60% and 2nd dose 7.53%. However, the questionnaires administered after the intervention showed that the information provided had positive results, as 88.00% of the respondents indicated intention to vaccinate with the vaccines that had not been carried out (Diphtheria-Tetanus-Pertussis, Meningitis B, HPV, Meningococcal A, C, Y, W-135) or completion of vaccinations. Also, a high percentage reported that important questions were resolved by the intervention (94.85%), while 86.47% were positive about similar updates. This is particularly important, as one of the main reasons stated for avoiding vaccinations was inadequate information.

92% of students found the subject of the intervention interesting and >95% were happy with the accompanying material (presentation and book). Almost 95% of students had the opportunity to have their questions about vaccines solved by a specialist certified health professional, while over 86% were positive about a similar presentation in the future.

According to the literature, vaccination rates among children and adolescents are declining, and there is strong concern in the medical community about the delay in vaccination and the impact this may have on Public Health. Although some intervention programs have been implemented worldwide, in Greece there is still no corre-

sponding program from a central health organization or university institution, to our knowledge. Vaccination information usually concerns younger ages and parents, and the agencies that organize educational programs are local health centers. 88% of students who attended the intervention reported that they are positive about completing their immunizations with the adolescent vaccines, according to the National Child and Adolescent Immunization Program. Almost 95% of students had the opportunity to have their questions about vaccines solved by a specialist certified health professional, while over 86% were positive about a similar presentation in the future.

Discussion

Adolescent vaccination rates remain a persistent challenge in public health, with many young individuals still under immunized against diseases that could cause morbidity. This gap is particularly concerning as vaccine-preventable illnesses can have serious consequences during adolescence. To address this issue, school-based interventions offer a promising avenue to boost vaccination coverage among this population. One key factor contributing to suboptimal adolescent vaccination is the shift in vaccination decision-making from parents to the adolescents themselves. Adolescents may face various barriers to vaccination, including concerns about vaccine safety, perceived lack of necessity, and discomfort with the vaccination process. School-based programs can help overcome these barriers by providing a trusted setting for vaccine education, addressing adolescent-specific concerns, and facilitating access to vaccination services. Our achieved goal was to make pre-adolescents and parents well informed on the importance and need of vaccinations after the informative lessons and leaflets. We consider that pre-adolescents understand how necessary vaccines are and will discuss about them with their parents. Also, we believe that the whole program helped parents understand the positive effects of vaccines, changed their attitude in case they have doubts and second thoughts and lead them to schedule their children's vaccinations. Thus, the primary outcome of our research was to increase vaccination knowledge/beliefs and furthermore vaccination rates. The adolescent vaccination intervention program was well received by the parents of the participating children. The students showed great interest in the subject of vaccinations and their willingness to get involved in matters concerning

their health was evident. 92% of students found the subject of the intervention interesting and >95% were happy with the accompanying material (presentation and book). 88% of students who attended the intervention reported that they are positive about completing their immunizations with the adolescent vaccines, according to the National Child and Adolescent Immunization Program.

We expect that our informative model will be widely accepted and adopted for application to practice in other Greek schools. The present study highlighted the need for the creation of more educational programs and interventions on health issues in Greek schools, given the significant lack of such training.

References

- Bethke N, Gellert P, Knoll N, Weber N, Seybold J. A school-based educational on-site vaccination intervention for adolescents in an urban area in Germany: feasibility and psychometric properties of instruments in a pilot study. *BMC Public Health* [Internet]. 2022 Dec 1 [cited 2023 Sep 16];22(1):1-14. Available from: <https://bmcpublihealth.biomedcentral.com/articles/10.1186/s12889-021-12443-8>
- Koch-Institut R. Impfquoten bei der Schuleingangsuntersuchung in Deutschland 2015. 2017 [cited 2023 Sep 16]; Available from: www.vacmap.de
- Vaccines and immunization [Internet]. [cited 2023 Sep 16]. Available from: https://www.who.int/health-topics/vaccines-and-immunization#tab=tab_1
- Vaccination and Immunization Statistics - UNICEF DATA [Internet]. [cited 2023 Sep 16]. Available from: <https://data.unicef.org/topic/child-health/immunization/>
- Gkentzi D, Tsagri C, Kostopoulou E, Fouzas S, Vantarakis A, Dimitriou G, et al. Attitudes and beliefs of parents about routine childhood vaccination in Greece. *Hum Vaccin Immunother* [Internet]. 2021 [cited 2023 Sep 16];17(9):3066-72. Available from: <https://pubmed.ncbi.nlm.nih.gov/33970788/>
- Danis K, Georgakopoulou T, Stavrou T, Laggas D, Panagiotopoulos T. Socioeconomic factors play a more important role in childhood vaccination coverage than parental perceptions: a cross-sectional study in Greece. *Vaccine* [Internet]. 2010 Feb 17 [cited 2023 Sep 16];28(7):1861-9. Available from: <https://pubmed.ncbi.nlm.nih.gov/20006570/>
- Nicolai LM, Hansen CE. Practice- and Community-Based Interventions to Increase Human Papillomavirus Vaccine Coverage: A Systematic Review. *JAMA Pediatr* [Internet]. 2015 Jul 1 [cited 2023 Sep 16];169(7):686-92. Available from: <https://pubmed.ncbi.nlm.nih.gov/26010507/>
- Si M, Su X, Jiang Y, Qiao Y, Liu Y. Interventions to improve human papillomavirus vaccination among Chinese female college students: study protocol for a randomized controlled trial. *BMC Public Health* [Internet]. 2019 Nov 21 [cited 2023 Sep 16];19(1). Available from: <https://pubmed.ncbi.nlm.nih.gov/31752785/>
- Sakou I, Tsitsika AK, Papaevangelou V, Tzavela EC, Greydanus DE, Tsolia MN. Vaccination coverage among adolescents and risk factors associated with incomplete immunization. *Eur J Pediatr* [Internet]. 2011 Nov [cited 2023 Sep 16];170(11):1419-26. Available from: <https://pubmed.ncbi.nlm.nih.gov/21465121/>
- Kanellopoulou A, Giannakopoulos I, Fouzas S, Papachatzis E, Nasikas S, Papakonstantinou A, et al. Vaccination coverage among school children in Western Greece from 2016 to 2019. *Hum Vaccin Immunother* [Internet]. 2021 [cited 2023 Sep 16];17(11):4535-41. Available from: <https://pubmed.ncbi.nlm.nih.gov/34473610/>
- Kaul S, Do TQN, Hsu E, Schmeler KM, Montealegre JR, Rodriguez AM. School-based human papillomavirus vaccination program for increasing vaccine uptake in an underserved area in Texas. *Papillomavirus Res* [Internet]. 2019 Dec 1 [cited 2023 Sep 16];8. Available from: <https://pubmed.ncbi.nlm.nih.gov/31654772/>
- Daley MF, Kempe A, Pyrzanowski J, Vogt TM, Dickinson LM, Kile D, et al. School-located vaccination of adolescents with insurance billing: cost, reimbursement, and vaccination outcomes. *J Adolesc Health* [Internet]. 2014 Mar [cited 2023 Sep 16];54(3):282-8. Available from: <https://pubmed.ncbi.nlm.nih.gov/24560036/>
- Humiston SG, Schaffer SJ, Szilagyi PG, Long CE, Chappel TR, Blumkin AK, et al. Seasonal influenza vaccination at school: a randomized controlled trial. *Am J Prev Med* [Internet]. 2014 Jan [cited 2023 Sep 16];46(1):1-9. Available from: <https://pubmed.ncbi.nlm.nih.gov/24355665/>
- Lehmann CE, Brady RC, Battley RO, Huggins JL. Adolescent Vaccination Strategies:

- Interventions to Increase Coverage. *Paediatr Drugs* [Internet]. 2016 Aug 1 [cited 2023 Sep 16];18(4):273-85. Available from: <https://pubmed.ncbi.nlm.nih.gov/27146296/>
15. Briss PA. Recommendations regarding interventions to improve vaccination coverage in children, adolescents, and adults. *Am J Prev Med*. 2000 Jan 1;18(1):92-6.
16. Stokley S, Cohn A, Jain N, McCauley MM. Compliance with recommendations and opportunities for vaccination at ages 11 to 12 years: evaluation of the 2009 national immunization survey-teen. *Arch PediatrAdolesc Med* [Internet]. 2011 Sep [cited 2023 Sep 16];165(9):813-8. Available from: <https://pubmed.ncbi.nlm.nih.gov/21893647/>