

Fish Oil Supplements for Schoolchildren: A Pilot Intervention in a Maltese School for Policy Formulation in School Communities

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Authors' contributions

This work was carried out in collaboration between both authors. Author AB (the school's assistant head) was responsible for the actual fieldwork (giving the supplements to the children, seeing that the project was running smoothly, and gathering and compiling data). The rest (developing the idea, research, project planning and the write-up of this paper) was done by the lead author CM. Author AB also approved the final version of the manuscript.

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ABSTRACT

Introduction: Fish oil containing vitamin D used to be administered in Maltese schools to treat rickets. The oil-soluble vitamins A and D are important for the immune system and vision (vitamin A). Its omega-3 is indicated for behaviour, concentration and learning. It can help in dyslexia, attention deficit hyperactivity disorder, and autism. A pilot project aimed at spreading fish oil awareness and encouraging the government to give this supplement to schoolchildren was set up.

Methods: Students from Years 3-6, (7-11 years) attending a girls' school participated. Risk assessments and parents' consent were taken. The soft chewable supplement contained 120mg omega-3, 667 I.U. vitamin A and 100 I.U. vitamin D. Compliance, dropouts and reasons for refusing to take the capsules were recorded. The students' parents/guardians were given a short questionnaire.

Results: Findings are based on 46 schooldays. 73 students started the programme. Due to vomiting or swallowing difficulties 58 girls continued the intervention. There were 43 respondents (parents/guardians) for the questionnaire. 86% were strongly in favour of this initiative; 14% were slightly less in favour. All respondents wanted this initiative to remain ongoing.

Conclusion: Given some recommendations for improvements, the results are hoped to initiate discussions for a national policy for fish oil at school.

Keywords: Attention deficit hyperactivity disorder; autism; dyslexia; omega-3; policy for fish oil; school; vitamins A, D.

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1. INTRODUCTION

Fish oil which is found in salmon, tuna, mackerel, anchovies, herrings, and other fish [1] has several health benefits. Unfortunately, many people, especially children do not like the peculiar smell and taste of fish and even those who eat fish are unlikely to take it fresh and regularly. Fish oil for children nowadays comes in the form of chewable, soft and flavoured capsules.

1.1 Background

Up to the late 1970s fish oil (actually, cod liver oil) used to be administered in liquid form in all state schools throughout Malta and Gozo [2]. Until the islands were under the British Empire this was standard schoolchildren's nutritional practice for the prevalence of rickets which was common at that time due to deficiencies of vitamin D (which is present in fish oil) [3]. It worked synergistically with the calcium from the milk which was also provided at school. Adults and senior citizens who remember this procedure in their old schooldays can still recall the unpleasant taste of fish oil!

1.2 Brief Literature Review

Whereas bone strength still remains one of the key benefits of vitamin D, it also plays an important role in immune function and according to some researchers it can be prescribed for Covid-19 infections [4]. When fish oil is obtained from fish tissue (instead of the traditional cod liver oil) it can also be a good source of vitamin A [5]. Apart from also having a role in immunity, vitamin A is essential for vision [6].

The beneficial effects of fish oil in schoolchildren have been studied extensively. Apart from vitamins A and D, fish oil contains omega-3 fatty acids: DHA (docosahexaenoic acid) and EPA (eicosapentaenoic acid). These are strongly linked with brain health of both children and adults. They can improve their behaviour [7], concentration and learning [8-10]. If the intake of these essential fatty acids continues later on in life, they may also help in delaying the onset of dementia [11-13].

Fish oil may also aid children with dyslexia [14,15] and attention deficit hyperactivity disorder [16-18]. Further observations show that if omega-3 is included in the diet during pregnancy the children born are likely to be more intelligent

[19]. Fish oil has also been proposed as a treatment for mood stabilization in children with autism spectrum disorder [20,21].

Problems associated with accumulating fat and cholesterol levels are not associated only with obese persons and adults. Early signs of atherosclerosis also showed up in the aortas of three-year-olds and the coronary arteries of teenagers [22]. Triglycerides in the blood can be substantially reduced with omega-3 which also improves the cholesterol profile [23]. Signs of atherosclerosis in young children have also been linked with the origins of hypertension [22]. Omega-3 can help attain substantial reductions in high blood pressure [24].

1.3 Aims

In view of the health benefits linked to fish oil in children, and some international debate on whether schools should start giving again these supplements to students [25], a pilot intervention with the aim of spreading more awareness was set up. The intention of this intervention is to send a message to the Maltese Government to offer fish oil supplements every day to all school children in Malta and Gozo with the desired goal being that this supplement, which nowadays comes in more attractive forms, finds its place again in the classroom.

2. METHODS

A small girls' school was selected for this study [26]. A small school, albeit not 'mixed' (boys and girls), offered the ideal setting for a pilot project requiring a low number of participating students. Four classes were involved, Years 3 to 6 with ages ranging from 7 to 11 years (see Table 1).

2.1 Risk Assessments

Risk assessments were discussed with the Health Authorities in view of any choking hazards and the measures imposed by the same authorities against the spreading of Covid-19 infection. Foreseeable risks that were assessed including respective control measures were the following:

- For accountability purposes, only one responsible educator distributed the capsules. One of the schools assistant heads was selected to do this job. Although the product is safe with three-

plus kids, children aged less than seven years were avoided as extra precautions. The capsules are so small, that they are unlikely, if ever, to cause complete choking. However, they can still cause partial blockade of airways and corresponding irritation for example, coughing or vomiting.

- Nevertheless, the responsible person had to have basic first aid knowledge of what to do in the event that a child is choking.
- Information about the project, type of product used, including any possible adverse effects such as allergies, was clearly communicated with the parents and guardians of the students and they were asked to give their consent. (See Consent).
- In order to comply with current Covid-19 measures, the students lined up and maintained the safe distance of two meters apart.
- Although the responsible educator washed her hands well before each distribution of the capsules, she never touched any capsules. They were gently transferred onto the container cap and dropped slowly one by one onto the palm facing upwards of each child. The fingers were slightly bent so as to prevent the capsule from falling down. If a capsule fell on the floor it was immediately discarded by the cleaner.

2.2 Research Material

A branded, tried-and-tested (in the sense that it has been on the market for a number of years) food supplement formulated for children aged from three-plus onwards was chosen for the study. The soft (rubbery) capsules were berry flavoured, easy to swallow and can be chewed. Each capsule that was given to the student contained 120 mg of omega-3, 667 I.U. of vitamin A, 100 I.U. of vitamin D and other vitamins.

2.3 Data Collection

The person responsible for distributing the capsules to the participating students in Years 3 to 6 had to take note of their compliance, record any permanent dropouts and make observations such as why they refused to take the capsules.

The parents or guardians of the girls who completed the programme until 1st June ($n^1 = 58$ students, see Table 1) were later given a short

questionnaire containing only two but vital questions. Confidentiality was emphasised. The questions were:

1. How do you rate this initiative? (1-5, 5 being the strongest).
2. Would you like to see the project being extended to the following scholastic years? (Yes/No).

3. RESULTS

The results reflect the fieldwork period between 1st March and 1st June 2021, a three-month period which translated into 46 schooldays that is, excluding weekends, online teaching periods and Easter holidays.

3.1 Description of Programme Adherence

Ninety-eight students from Year 3 to Year 6 were eligible to participate. On receiving the application forms and vetting of the parents' consent a sample of 73 students ($n = 73$) started the programme on 1st March 2021 as per Table 1. Their average age was 8.9 years.

However, for reasons beyond their control such as vomiting or difficulty in swallowing (some students found the capsules rather hard to chew) there were 15 students who dropped out leaving 58 girls who continued until data was gathered on 1st June ($n^1 = 58$) thus implying a dropout rate of 20.5% and an adherence figure of 79.5%. The intervention continued until available stock of fish oil supplements was depleted (approximately when the scholastic year was about to end).

3.2 Main Results

A mini questionnaire was given to the 58 students (n^1) who continued the programme.

There were 43 respondents (parents or guardians) meaning a response rate of 74%. The findings for the first question (How do you rate this initiative?) were very positive and are shown graphically in Fig. 1. Eighty-six per cent (37 respondents) of the total respondents were strongly in favour of this initiative leaving only 14% (6 respondents) who opted for the previous (fourth) number of the five-point Likert scale.

Table 1. Description of the participants: Age and dropouts

Primary class	Age group in years	Number of girls who started	Number of girls who dropped out	Number of girls who continued
Year 3	7 - 8	22	11	11
Year 4	8 - 9	18	3	15
Year 5	9 - 10	14	1	13
Year 6	10 - 11	19	0	19
		n = 73	total = 15	n ¹ = 58

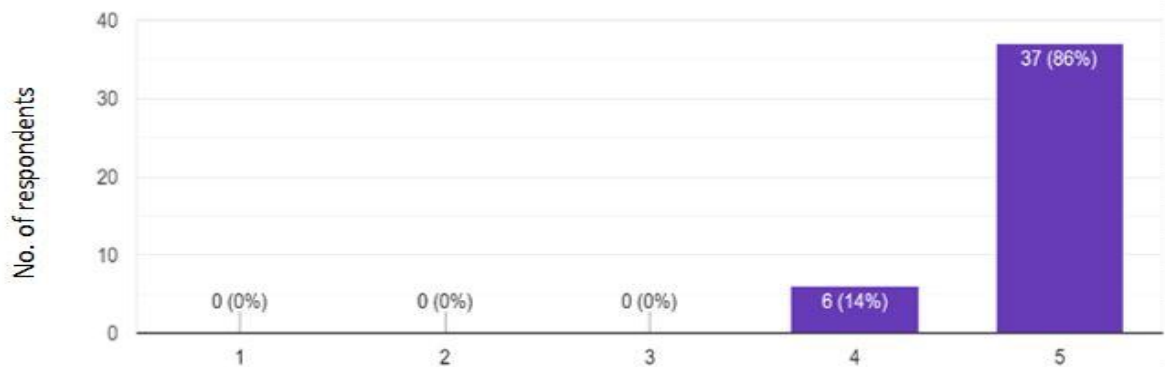


Fig. 1. How do you rate this initiative? (1-5, 5 being the strongest)

The results for the second question (Would you like to see the project being extended to the following scholastic years?) were absolutely positive: all respondents agreed that they wanted to see this initiative ongoing for the scholastic years that follow.

4. DISCUSSION

After more than four decades when fish oil stopped being given to schoolchildren in Malta, our goal to show that fish oil supplements can be administered at school, even during the Covid-19 restrictions, was achieved. This study observed the social aspect of fish oil at school particularly, in terms of acceptance, compliance and parents' reactions. Excluding the Year 3 group, the results from Table 1 and the questionnaire replies including Fig. 1 are promising and encouraging. These are hoped to give a message to the Maltese Government to offer fish oil supplements every day to all Maltese school children.

However, one should remember that questionnaires dealing with programme satisfaction usually tend to err on the 'happy' side. So, apart from protecting personal data, the other reason why anonymity was stressed was to maximise the chances of securing accurate and honest replies.

The negative effects that were encountered basically, swallowing difficulties and vomiting,

were mostly seen in Year 3 students (7 to 8 years), where half of the group dropped out (from 22 to 11 girls). This negative trend decreased sharply with increasing ages until it was no longer a problem with Year 6 students (10 to 11 years). According to the Mayo Clinic, fish oil supplements taken within the recommended guidelines can cause mild side effects, such as: fishy aftertaste and bad breath; heartburn, nausea and diarrhoea; and rash [27].

As the study focused on the general lifestyle school habit of taking fish oil at school, any one-offs missing of the dose due to an occasional stomach upset or odd absenteeism on an individual basis were not considered as dropouts. Only the 20.5% of the girls who permanently did not continue the programme were considered as dropouts and this gave an adherence figure of 79.5%.

A comment on the literature that was reviewed should consolidate this study. It should be noted that in medicine, several study results need to be replicated before a final statement by an authoritative organisation is made. There is nearly always an element of doubt even when proper research is carried out. If one had to read the actual clinical trials, they all end up more or less saying that omega-3 offers a promising treatment for so and so, or that more studies are required to confirm these results.

This 'healthy' sceptic approach however, does not mean that we cannot offer a natural food supplement at school. After all, we are not using therapeutic (high) doses and no one has found that if we stick to recommended guidelines there could be any serious harm, unless it is an allergy issue.

It is also worth mentioning that this was not a clinical trial; that would entail bioethical research approvals and strict controls. Only half the daily dose recommended by the manufacturer was used. The second capsule should normally be taken in the evening when children are at home but this was not recorded or reported as a study limitation as it was outside the scope of this project (we were not after any health benefits). The evening doses were not even supplied to their parents or guardians as we did not want to put extra pressures on them whilst at home. Furthermore, as we have already seen in the Introduction, the evidence of the fish oil's benefits for children is already published in several scientific journals. This however, does not undermine the work taken to undertake this project. Preparations had been going on since mid-2019 and did not stop throughout the summer holidays of 2020 or amidst the pandemic crisis. Selecting the best and most suitable product, making risk assessments, getting permission from the Health Department, the cooperation from parents and guardians and data collection all had their toll.

5. CONCLUSION

The project was conducted during a very challenging period. Apart from the Easter holidays that came in between, there were moments when all schools in Malta had to go online because of the pandemic crisis. Covid-19 restrictions had impeded the start of the project at the beginning of the scholastic year with several other issues that kept postponing the launch for later dates until it finally started on 1st March 2021.

In view of the high dropout rate of 50% in the Year 3 group, if another similar study is conducted, it is recommended to start the intervention from Year 4 onwards (8 to 9 years), to use a wider range of ages (basically, involving secondary school students), and include other genders: boys and gender identity students. There could also be a questionnaire for students with questions that would be easy to understand.

Health wise, it would also make sense to use a higher single dose product of omega-3 so as to avoid the need for an evening intake of the same supplement. Like that, it would be ensured that children would be taking the full dose of omega-3 which according to the WHO recommendations for primary schoolchildren is around 250 mg daily [28] unless they have specific conditions when they would usually need higher doses. For children who follow vegan diets, or are allergic to fish, or for whom the fishy aftertaste bothers them, they should be offered alternatives to fish oil. These are usually derived from algae but it is important that they are fortified with vitamin D.

Overall, the results of this project are promising and are hoped to initiate discussions for a national health policy for fish oil supplements at school. It is understood that for any government to invest the funding necessary to provide this supplement for free to all schoolchildren, a cost-benefit analysis needs to be carried out. This is however, beyond the scope of this paper because governments buy in bulk and hence get the product at much cheaper prices, and are not bound to use the same product that we have used in this intervention. Furthermore, as fish oil offers several health benefits it is not easy to calculate the costs that would be saved and in order to see the real difference, the doses would need to be therapeutic and hence higher than when supplying the supplement for the school community in general.

There were other positive attributes that emerged from this intervention. As one of the authors who came up with this idea is a father whose daughter attends the school where the project was conducted, the study illustrates an excellent example of collaborative work between educators and parents – including all the parents and guardians of the participants who also cooperated by filling up consent forms and questionnaires. Finally, it is also worth remarking that a school can also be exploited to serve as setting for good health practices to emerge and grow in hope of eventually spreading out into other schools and the community.

In spite of certain shortcomings, the robustness of the article lies in the successful setting up of a pilot intervention amidst Covid-19 restrictions and its potential to affect policy changes with respect to the myriad of health benefits which fish oil can offer to schoolchildren. An intervention of a healthy lifestyle habit at school, apart from

educating children on what vitamins to take, and generally making them healthier, has chances to be followed throughout the rest of their lives. After all, omega-3 also offers therapeutic benefits for adults and senior citizens.

HIGHLIGHTS

- Until 40 years ago fish oil (vitamin D) was administered in Maltese schools to treat rickets.
- Its vitamins (A, D) are important for the immune system and vision (Vitamin A).
- Omega-3 present in the oil has several benefits on the child's brain.
- A 46-day study was conducted in a girls' school (7-11 years).
- Encouraging results are hoped to contribute to a fish oil policy at school.

FUNDING

This research did not receive any specific grant from funding agencies.

DISCLAIMER

The selection of the product including purchase was made through a fair process based on the cheapest quote received from quotations sent to three local pharmaceutical agents. These importers received the same standard letter of requirements and specifications (see Appendix 1).

ETHICAL APPROVAL

This is not a clinical trial. The product was already tried and tested and has been available on the market for several years (see Appendix 2).

CONSENT

As per international standards, parent or guardian consent was obtained in the form of an information letter whereby they had to reply stating whether they wanted their children to participate or not in this pilot intervention (see Appendix 3).

ACKNOWLEDGEMENTS

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I am also grateful to Ms Carla Florian, the representative of Holland and Barrett for meeting our specifications of the quotation letter and delivering the product on time. We used H & B Healthy Kids Omega 3 Fish Oils with A, D, E & C.

Last but not least, the success of this project is also attributed to Dr Kenneth Vella, Head of Mater Boni Consilii St Joseph School for believing in the potential of this initiative, and for communicating with parents and guardians who were eligible to participate. He also allowed us to use the school premises with the students and necessary school staff. The collaboration of the parents is also appreciated.

COMPETING INTERESTS

The authors have declared that no competing interests exist.

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Appendix 1.

The template of the quotation letter which was sent to three pharmaceutical agents in Malta. Please note that the project was originally planned to be launched in the beginning of the 2020-2021 scholastic year but due to Covid-19 restrictions was moved to a much later date of the academic year.

Dear Sir / Madam,

8th March 2020

We wish to conduct a three months pilot project in a small school at Paola whereby students would be receiving an omega-3 supplement per day.

Please send us a quote with exact product details for approximately 5,000 capsules. A bulk buying discount would be greatly appreciated.

The items have to be in our hands before the end of this scholastic year and their expiry date should be sufficient to cover the period of the pilot project (October to December 2020) by at least three months beyond (ie. March 2021).

I am copying the Head of school.

Kind regards,

Name & surname
Position
Contact information

Appendix 2.

Product information

Holland & Barrett Healthy Kids Omega 3 Fish Oils with A, D, E & C Bursting Berry Flavour 60 Chewy Capsules



- Fish oils are rich in the Omega 3 fatty acids EPA and DHA
- Together, EPA and DHA contribute to the normal function of the heart
- DHA contributes to the maintenance of normal vision and brain function (daily intake of 250mg required to see beneficial effects)

Exclusively formulated for children to help provide a healthy heart and vision, Holland & Barrett Kids Omega 3 Fish Oils provide the nutrients kids need with a tasty berry flavour.

Unfortunately, the body cannot make these essential fatty acids, so they must be sourced from the diet. One of the best sources is oily fish, but its distinctive taste is unappealing for many children. Conveniently, these capsules provide the essential fatty acids but without the fishy taste; perfect for children over the age of 3.

Appendix 3.

Letter and consent



21st December 2020

Dear Parents & Guardians,

I would like to inform you about an initiative that was brought forward by a parent of one of the girls attending our school - Mr (name of parent), who has come with the proposal of giving fish oil or omega 3 to school children.

The idea of going back to the 1950s, 60s and 70s when fish oil (at that time it was not palatable to take!) is backed by scientific evidence. For your convenience, Mr. (name of parent) has provided this short summary about the benefits of omega 3 in schoolchildren.

Omega 3 which is found primarily in fish oils, is strongly linked with brain health of both children and adults. It can improve behaviour, concentration and learning in children. Making it a habit to keep taking omega 3 later on in life when children become adults may also help to delay the onset of dementia (again has to do with brain)!

Research is also showing that fish oil may help children with dyslexia and attention deficit hyperactivity disorder, and that fish oil in pregnant women's diet may improve the offspring's intelligence. Fish oil has also been proposed as a treatment for mood stabilization in patients with autism spectrum disorder.

Apart from brain health, omega 3 has several other benefits and is also associated with adult health. Up to the late 1970s fish oil used to be administered in all state schools in Malta. This was standard schoolchildren's nutritional practice throughout the British Empire due to the prevalence of rickets (bow legs) which was common at that time due to deficiencies of vitamin D (also present in fish oil). Recent research is also recommending vitamin D to reduce Covid-19 risks!

So, with the help of our educators and a local supplier who is offering us a quantity of flavoured omega 3 chewable capsules (which we will buy from your generous donations), we decided to offer these capsules to Grades 3, 4, 5, and 6 with the aim of raising awareness on the benefits of fish oil in children. In the future, we do not exclude to spread the initiative throughout the whole school but for the pilot project we have decided to start with these four classes.

The brand name of the product to be used is, 'Holland and Barrett Healthy Kids Omega 3 Fish Oils'. After discussions with the Ministry of Education and Health Authorities, we are planning to start offering this food supplement as from next month for up to about three months. The product is safe for use in children. The capsules are small and slippery and can also be chewed. In view of the pandemic, apart from the recommended hygiene practices, the capsules will be offered in the same manner as when receiving Holy Communion on the palm of the students' hands.

However, as with any supplements, there can be some risks. The intake of this product is not obligatory and from our end, we assure you that the distribution of the capsules will be carried out by responsible staff who will make sure that only one capsule has been taken and that your child is not choking or showing any signs of allergy. Nevertheless, the school staff cannot be held responsible for any mishaps that might occur out of our control. Your child is always free to refuse to take this supplement and to start taking it again whenever she wants.

In view of this, if you have any queries about this initiative and the information that we are providing you, please feel free to contact me on the following email address:

Once you have made a decision, kindly fill up the following consent form and return it back to us **by Thursday 7th January 2021**. In the same consent form, we are also asking you whether you would like to participate in a short questionnaire at the end of this three month initiative.

Best regards,

Name of Headmaster

Omega 3 Fish Oils – Consent Form

Kindly fill in this form and send it to school by not later than **7th January 2021**.

We, Parents/Guardians of _____ of class _____ give consent / do not give consent to our daughter to participate in this project.

Signature of Parents/Guardians

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