



GRADUATION PROJECT

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The Challenge of Dental Education in the Developing Countries

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ABSTRACT

Introduction: Oral hygiene is very important as it is an indication of a person's overall wellbeing. Some factors affecting oral health are socioeconomic status, education level, culture, diet, and access to health care. There is a great disparity in oral health, as developing countries do not benefit from the higher standards of oral care. Schools have a great impact on the oral health status as they allow access to children and can be a place for the promotion of the oral health. A country that's had challenges with the oral hygiene of its youth has been the Philippines.

Objectives: The review intends to understand the reasons that developing countries face challenges in dental education. Furthermore, to analyze organizations in developing countries that educate and improve oral health of children, and to use a similar model to launch an initiative that can further aid in combatting the challenges of dental education in developing countries.

Material and Method: A review of journal articles and books was conducted using Pubmed, Medline and Google Scholar. The resources were analyzed, and the relevant works were included in the review.

Results: The Philippines has below average oral health as a large portion of children suffer from oral diseases. The Fit for School program implements daily handwashing and toothbrushing in schools. Longitudinal studies indicate that the prevalence of caries has been reduced and children are healthier.

Conclusions: Iraq is a developing country that also has below standard oral health and education in children. The successful model of the Fit for School program was used to initiate a similar organization called "The Healthy Smile Project" with an objective to improve dental health and education.

KEYWORD

Dentistry; Philippines; Education; Developing Countries; Children.

RESUMEN

Introducción: La higiene oral es crucial ya que refleja el bienestar general de una persona. Los factores que afectan la salud oral incluyen el nivel socioeconómico, el nivel educativo, la cultura, la dieta y el acceso a la atención médica. Los países en desarrollo carecen de los estándares más altos de atención dental, lo que lleva a disparidades en la salud oral. Las escuelas tienen un papel importante en promover la salud oral y proporcionar acceso a los niños. Filipinas ha enfrentado desafíos para mantener una buena higiene oral en su juventud.

Objetivos: Esta revisión tiene como objetivo comprender por qué los países en desarrollo enfrentan desafíos en la educación dental, analizar organizaciones que educan y mejoran la salud oral de los niños en países en desarrollo, y lanzar una iniciativa para combatir los desafíos en la educación dental.

Materiales y Métodos: Esta revisión buscó artículos y libros relevantes en Pubmed, Medline y Google Scholar. Los recursos se analizaron y se incluyeron obras relevantes en la revisión.

Resultados: Filipinas tiene una salud oral por debajo del promedio, con muchos niños sufriendo enfermedades dentales. El programa Fit for School promueve el lavado de manos y el cepillado diario de los dientes en las escuelas. Estudios longitudinales muestran una reducción en la prevalencia de caries, lo que indica niños más saludables.

Conclusion: Irak es otro país en desarrollo con una salud oral y educación deficientes. El modelo exitoso del programa Fit for School inspiró una organización similar llamada "El Proyecto Sonrisa Saludable" para mejorar la salud y la educación dental.

PALABRA CLAVE

Odontología; Filipinas; Educación; Países en desarrollo; Niños.

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INTRODUCTION

1.1 Effects of oral hygiene on a person's wellbeing

Oral health is an essential aspect of healthy living, such that maintaining an adequate hygiene can help prevent halitosis, tooth decay, and periodontal disease. Cavities are one of the most common chronic diseases in many parts of the world. The oral health surveillance report conducted by the Centers for Disease Control and Prevention indicated that by the age of 8, over 50% of children in the United States had a cavity in their primary teeth(1) . This figure is even higher in families with lower incomes(1). Oral health is not only fundamental to a person's general well-being, but it also plays a crucial role in the social aspects of their life. On a physiological level, oral health and the overall health of a person are very closely linked. The mouth is the main pathway into the human body, and it harbours millions of bacteria(2). Although most of the bacteria that is present in the mouth are harmless, if the oral hygiene is not maintained, some opportunistic bacteria will also be found. Some studies suggest that periodontal disease due to bacteria may also contribute to other serious illnesses, such as endocarditis, pneumonia, cardiovascular disease, and may led to complications during pregnancy and the birth of a child(2). In addition to physical health, having a healthy mouth enables children in many other aspects. For instance, having a disease-free mouth allows a child to eat, speak and socialize without feeling embarrassed or discomfort. A healthy mouth enables children, boosts their confidence, and allows them to succeed in many aspects of life(3). Studies have demonstrated that children with oral health diseases are far more likely to have their activities restricted and are subject to missing many days of schooling per year, which in turn, affects their performance(4).

1.2 Factors affecting oral health

Oral pathologies arise due to multifactorial causes. One cannot simply point to one factor as the primary causing principle of dental caries and other oral diseases. In addition to biological causes, there are several social contributors to the appearance of oral

pathologies. Some of the factors that have been documented as causes that increase the risk of developing oral diseases are the positive correlation between socioeconomic status (SES) and oral health, education level, cultural beliefs, diet, and access to health care. A schematic of this is shown in Figure 1(5).

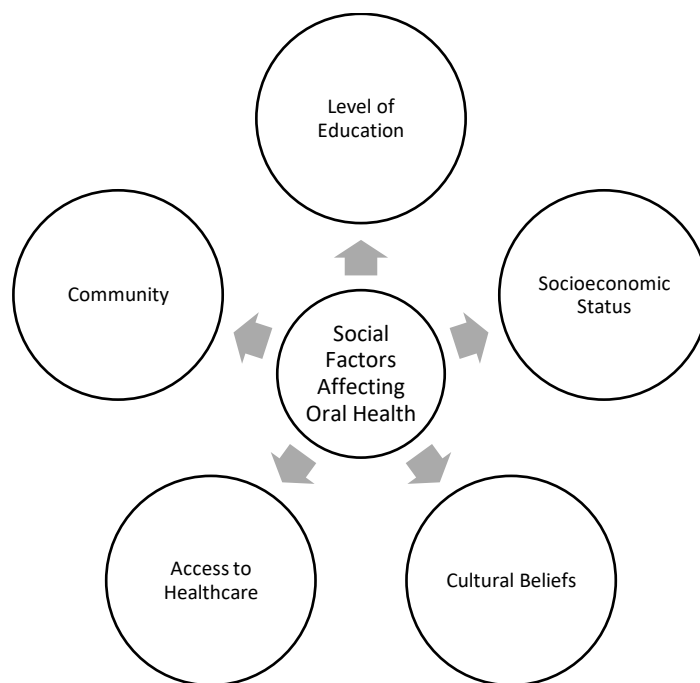


Figure 1: Diagram outlining the different factors involved in determining oral health(5).

Socioeconomic status is one of the main social indicators of the outcome of oral health(6). Previous research has been consistent in showing that individuals with lower socioeconomic status are at a greater disadvantage and have a higher likelihood of poor oral health, including a higher rate of periodontal disease, tooth loss, and dental caries. These outcomes are often attributes to several factors, such as poor nutrition, limited access to healthcare facilities, as well as increased levels of stress(6,7). Families with lower socioeconomic status may face difficulties affording routine dental check-ups. In time, the lack of preventive care may grow to present more significant oral health diseases. Furthermore, poor nutrition is a common trait amongst families of lower socioeconomic status. Poor nutrition has proven to be a contributing factor to oral pathologies such as dental caries(6). Another common

factor amongst individuals from lower socioeconomic status is higher levels of stress. Stress contributes to higher levels of dental caries through different physiological mechanisms, such as increased inflammation, and reduced levels of immunity(7).

Although not particularly linked to socioeconomic status, cultural beliefs and practices have a great impact on oral and general health outcomes. For instance, chewing the betel nut and heavy tobacco use are common cultural practices and are linked with oral cancer and other oral pathologies. Diet is closely related to one's culture. Heavy sugar consumption is another factor found in many cultures around the world. This is known to have many health implications, including an increased risk of dental caries(8).

A strong social support system is another important factor to the maintenance of a healthy oral hygiene. A study by Maryam Amin at the University of Alberta, demonstrated that a strong social support system has been associated with greater engagement in healthy oral behaviours such as flossing and brushing regularly, as well as more regular visits to the dentist(9). Individuals who have supportive parents, friends or partners are more likely to be encouraged in maintaining better oral hygiene habits. They are also more likely to being reminded to schedule dental visits.

Accessibility is another factor that has a significant impact on the status of oral health. Access to dental care is primarily based on the social constructs of the society that a family is situated in. These factors include government aid programs, healthcare system, number of professionals available in a particular region, and access to roads and transportation(10). A study by Singhal et al. demonstrated that individuals with dental insurance or those who live in areas dense with healthcare professionals are more likely to have better oral health outcomes and receive preventative care. Furthermore, the study indicated that individuals who in fact did have an insurer, visited the dentist more often for routine check-ups and cleanings(10).

Perhaps, one of the most important factors that contribute to difficulties in maintaining high levels of oral hygiene is the level of education. Several studies conducted demonstrate that individuals with higher levels of education have better oral health compared to those with lower levels of education(11–14). This theory can also be applied to schoolchildren. A systemic review and a meta-analysis conducted by Caroline Stein et, al. concluded that oral health education amongst children between the ages of 5 and 18 was an effective way in reducing plaque and caries. Despite the findings, the authors of the study suggest that there is yet to be enough studies that can conclusively indicate that interventive programs are in fact responsible for the reduction of dental diseases (15). One reason why the level of education is positively correlated with higher oral health standards is because people with higher degrees of education, often, have greater access to resources that better promote oral health. These resources include a healthier diet, jobs that provide dental insurance, and better access to dental clinics(11). They also have more access to resources and information that increases their knowledge of oral health. Jackson et al., state that people with higher education levels are more knowledgeable about the importance of flossing and brushing on a regular basis, as well as having a better understanding of the dangers of alcohol, tobacco and an unhealthy diet(14,16). In theory, higher education should yield better oral health. However, Sabbah et al., indicates that this may not always be the case. The correlation between education and oral health is not always a positive one. For instance, while people with higher education may have greater access to jobs and resources, they may also face greater levels of stress and anxiety. Such stresses may lead to unhealthy lifestyle habits, and an increased consumption of drugs, tobacco and alcohol, negatively impacting oral health(12). In summation, education can increase access to resources, which in turn, allows individuals to make better lifestyle choices, and live a healthier life.

Social factors play a great role in explaining why developing countries struggle to educate their youth about the importance of dental hygiene. The lack of public infrastructures and funding limit the public health initiatives that could be placed towards improving oral health(17). In addition to the financial and the material resources, human resources also

serve a great importance. In developing countries, there is a lack of access to healthcare professionals that can provide the adequate education and teach children about the importance of oral hygiene(18). Oral pathologies arise due to multifactorial causes. Although important, social factors are only one part of a complex mechanism of causes related to poor oral health. By understanding the factors, and how they are interconnected, we can work to develop effective strategies to improve health and reduce oral diseases.

1.3 Oral health in developed vs. developing countries

As evidenced by the knowledge of health statistics around the globe, there is a great disparity of oral health care between developed and developing countries. This imbalance continues to grow as countries in the Western world implement improvements to their health care system, while most of the world struggles to provide their population with adequate resources and services. Health care systems play an important role in the development of any country, both on an individual level, as well as the collective level of the population. A successful health care system relies on the combined efforts of public and private institutions, the government system, and resources that are allocated to improving the health of the people(19). There are noted differences in the healthcare systems of developed and developing countries that may suggest the staggering variance in oral health. A key difference between developing versus developed countries is a prevention component(19). Countries that have a well-established health system, the health centers provide professionals from many different branches of medicine and well-being. There is an effort to have a multidisciplinary approach to health with a clear line of communication, contributing the success of the whole makeup of the health system. Doctors, nurses, dentists, therapists, and administrators all work together with the common goal of bettering the health of their communities and their country as a whole(19). Such facilities are often equipped with state-of-the-art medical equipment and are always keen on technological advancements. A combination of the aforementioned factors contributes to providing a health care system that goes beyond simple intervention. Developed countries provide the benefit of a system which allows for the early detection of illnesses, enforces a

line of communication and education between professionals and patients, identifies and reduces risk factors of certain diseases, and in general, increase the quality of life. As opposed to developed countries, developing countries do not have the same luxuries which would allow them to run their health system in the same efficient manner. The lack of healthcare professionals, infrastructure and resources eliminates the preventive component in the healthcare system. A study conducted by Varenne B et al. in Burkina Faso proved that the level of knowledge and attitude towards oral health hygiene is low, specifically in rural areas where there was a decreased access to dental professionals. In 2003, the World Health Organization released a report indicating that in Africa, the dentist to patient ratio is 1 : 150,000 while in most industrialized countries, that ratio is about 1 : 2000 (19). In developing countries, the main objective is to provide emergency services as a point of intervention(19). Regardless of the approach, the common goal between developed and developing countries is to improve health. One of the most important ways in which countries can achieve their goal of improved health is by the number of resources that are dedicated towards the healthcare system. Developed countries have a well-established system due to the research conducted, which allows them to understand faults and discrepancies, and to be able to dedicate resources to fix those problems. Whereas in developing countries, there is a lack of information on oral diseases due to the financial and personnel limitations. In turn, this leads to even less finances being dedicated towards oral health. To further validate the point that distribution of finances plays a great role in oral health, studies demonstrated that underprivileged areas of developed countries portrayed similarities to the status of oral hygiene in developing countries(20).

1.4 Impact of schools on oral health

Schools play a key role in the upbringing of children around the world. Kids gain many valuable lessons by attending school. Although academics is the focus of school systems, the reality is that in the great scheme of things, the academic knowledge that children gain makes up a very small percentage of what they gain from schools. Children develop social skills, communication and form habits that remain with them far beyond school(3). Schools

can be a great place for the promotion of oral health due to the ease of access. Through schooling, there is access to over a billion children worldwide (3). Schools can influence a child's health and well-being. Researchers can take advantage of the access that schools provide them to promote oral hygiene, allowing children to be more informed, and make healthier life choices. Healthy habits built during a young age can develop into a routine and a lifestyle which can be maintained for a long time. The benefits of setting of in school programs is that the cost is very low, and there is access to a great portion of the population. Educators that can implement a system are already in place, eliminating further personnel costs. Furthermore, there is a level of trust between teachers and their students. With this foundation of trust, children are more likely to be attentive, and follow instructions.

1.5 The challenges of oral hygiene in the Philippines

Based on research, the environment a child grows up in is a great indicator of their overall health. A child's social and cultural upbringing may influence their habits from a young age. Governments often fund different organizations and professionals to provide healthcare to vulnerable persons. If resources are limited, people may not have access to hospitals and professionals who are tasked with improving people's health. Countries that are considered to be low and middle income contribute to the make-up of 90% of school aged children in the world(21). Unfortunately, the living conditions in such countries leads to a cycle of poverty related diseases. Lack of clean water and sanitation facilities, overcrowding, and poor personal hygiene are all factors that cause serious health problems(21). Diseases such as worm infections, oral diseases, respiratory diseases, skin diseases, diarrhea are common, and thus are often neglected. One country that boasts a plethora of health conditions in children is the Philippines. In Philippines, diarrhea and respiratory tract infections are amongst the top three causes of mortality in children below 10 years of age. Hand washing is proven to be the single most important intervention in reducing the transmission of such diseases from one person to another, and thus, the government has implemented hand washing programs as an effort to reduce the mortality rate. Dental diseases are another concern that effects Filipino children. "A recent National Oral Health Survey (NOHS) showed

that 97% of grade I children (6 ± 1 year) and 82% of the grade VI children (12 ± 1 year) suffered from tooth decay” (21). Untreated dental caries leads to further complications. The prevalence of pulpal involvement and odontogenic infections is considerably high in children who are not treated for caries. Furthermore, the odontogenic infections have proven to lead to a lower BMI, affecting the metabolic pathway and causing anemia. Toothaches in children affects their food intake, lowers their quality of sleep and is the main reason why children are absent from school in the Philippines (21). The World Health Organization has indicated that the main way that tooth decay can be prevented in children is through the use of fluoride(22). Based on the recommendation of WHO, countries such as the Philippines have taken advantage of the accessibility that school provides to children, to reduce many of the diseases that their countries are plagued with. One such program that was implemented in the Philippines is the “Fit for School” program(21), which is discussed in greater detail in the “Results” section.

1.6 Justification of the review

People living in certain countries have the benefit of leading healthy lives, while people in developing countries do not enjoy the same rights. One of the greatest discrepancies between developed and developing countries is oral hygiene, particularly, the amount of caries in children. Children living in developing countries lack the dental education that is important to maintaining a life without oral diseases. This review intends to understand the reasons why developing countries face challenges in educating their youth about dental health. Many organizations have been put in place to overcome the challenges that these countries. By analyzing the success of organizations such as “Fit for School,” we may be able to emulate their models in other parts of the world and help to combat the challenges faced in dental education.

OBJECTIVES

1.1 General Objectives

1. Education is a key aspect to understanding our own bodies and allowing ourselves to live a health and optimal life. The fundamental purpose of this article is to understand how developing countries face a challenge regarding dental education.

1.2 Specific Objectives

1. This article intends to review the discrepancies between the oral hygiene in developed versus developing countries, and the role that education plays in such discrepancy.
2. A further objective is to study the measures that developing countries, such as the Philippines have taken to combat the challenges of dental education in children, and how a particular program can be used as a model and implemented in other parts of the world to improve oral health.

MATERIALS & METHODS

1.1 Understanding the purpose of the study

The purpose of the study was to demonstrate that developing countries face a challenge of educating their children about the importance of oral hygiene. To corroborate the hypothesis, a thorough bibliographic research had to be conducted. It is important to note that as a requirement of gathering relevant and important data, one must understand the aim and direction of the search. To better understand how education is one of the challenges faced in developing countries, one must conduct a generalized search of factors that negatively affect oral health. Furthermore, the research should be able to distinguish the differences in the oral health of developing and developed countries.

1.2 Database Research

Once the focus of the research is established, a systemic and qualitative analysis is conducted. To gather evidence, three online databases were searched. The databases that were used are Medline, Pubmed, and Google Scholar. Based on the identified purpose of the study, certain keywords were selected and searched either individually or in combination by using AND/OR in the search bar. The selected keywords that were used were, "oral health," "oral hygiene," "developing countries," "developed countries," "inequality," "children," "education," "school," "Philippines," "Iraq," and "India," Some searches lead to the finding of many articles, while others did not. The keywords were continuously refined to yield results that were more in line with the thesis of the article. General terms, such as developed and developing yielded few results. These terms were replaced with more specific searches. For example, "oral hygiene" AND "developing countries" was replaced with "oral hygiene" AND "Philippines."

1.3 Inclusion & exclusion criteria

The search results yielded hundreds of articles. To refine through all the collected data, the titles of the articles were skimmed through, eliminating all irrelevant data. Furthermore, the abstract of the articles were read to gain a better understanding of the data collected, identifying the research which would be beneficial in aiding the thesis. To ensure that the research gathered is reliable, scientific journals that are peer reviewed by respected members of the scientific community were used. Science is a fluid concept that is constantly changing. New theories disprove what we once knew as fact. For such reason, the data collected was focused on work that had been done in the last twenty years. Despite the attempt to exclude research that was conducted prior to 2002, one study was an outlier as it was conducted in 1985. The challenge was analyzing the data in the study and proving that the study that was conducted over forty years ago does not refute other data which has been collected since. The study conducted by Leif Glavind titled “Oral hygiene instruction in general dental practice by means of self-teaching manuals” focused on the different techniques that patients may be motivated to improve their oral hygiene. The focus of the study was self-teaching techniques versus active coaching. It can be argued that the concept and importance of education is a topic that remains relevant throughout generations. Despite the date of the article, the research gathered is based on a topic that would still be relevant today. Thus, the article was allowed to be used in study.

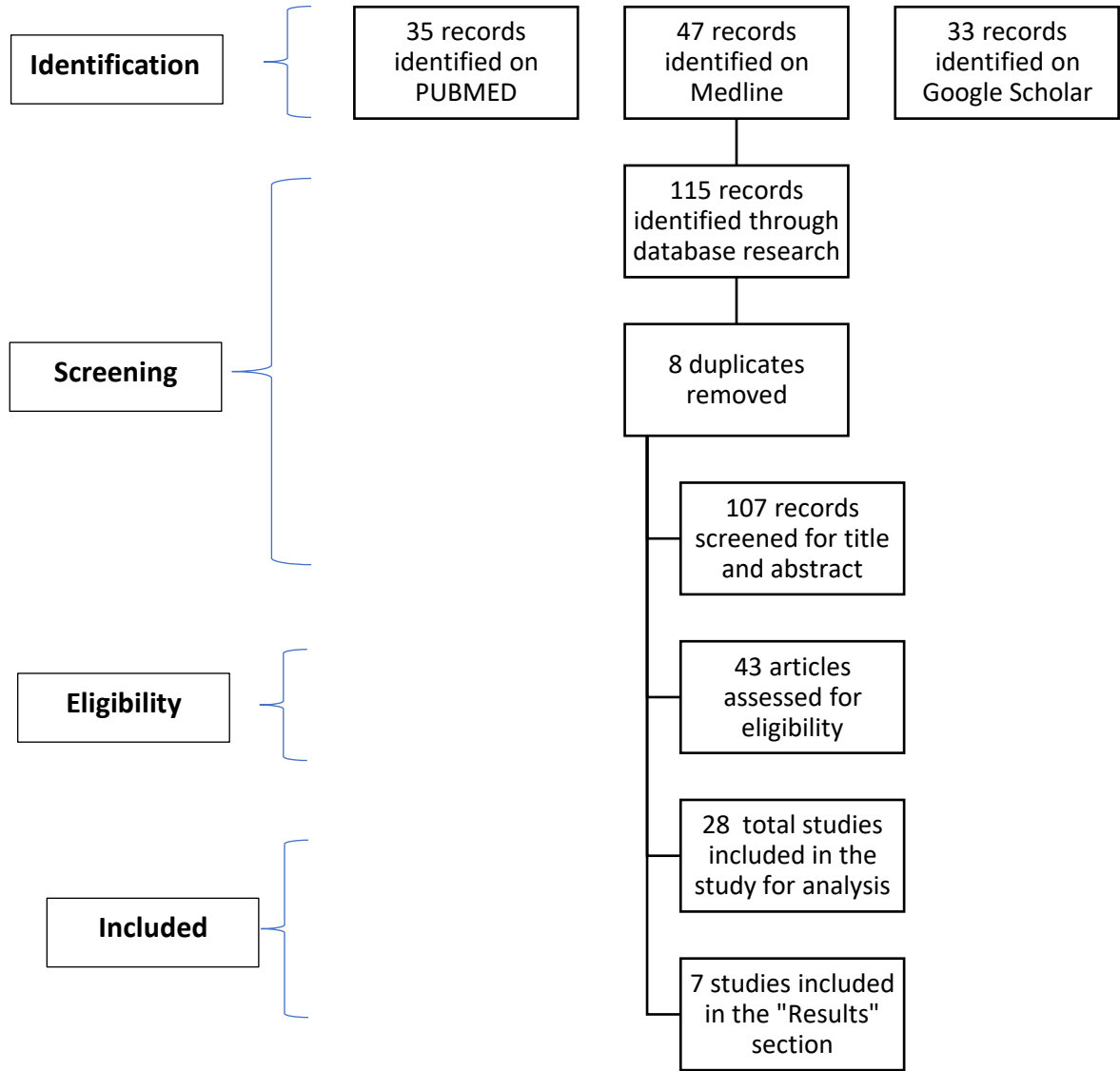


Figure 2: PRISMA flowchart outlining the article screening and selection process.

RESULTS

1.1 Justification for oral health intervention in the Philippines

Around 90% of school-aged children live in low- and middle-income countries such as the Philippines and lack resources such as proper housing, nutritious food, and healthcare (7). The Philippines requires a preventative program to address these issues. Education is a vital element in any country's development, but for it to be effective, children must be healthy and able to attend school. Health and education sectors worldwide have collaborated for years to educate children and improve their health. While policymakers believed that knowledge acquisition would motivate children to make healthier choices, research shows that knowledge alone is not enough to change behavior. The Ottawa Charter emphasizes that promoting oral health goes beyond education and requires institutions to enforce healthy habits and create a healthy school environment with activities that encourage control and responsibility for one's health. In the Philippines, there is a high prevalence of infections and untreated dental caries among children. Implementing interactive health programs like "Fit for School" can encourage school children to actively make healthy lifestyle changes while increasing their knowledge of healthy living.

1.2 "Fit For School" health program

The Focusing Resources on Effective School Health (FRESH) Framework was a joint project organized by WHO, UNICEF, UNESCO, and the World Bank. FRESH aimed to promote an action-based health promotion program in schools. In the Philippines, the FRESH framework was used to implement the "Fit for School" program, which aims to address the most prevalent diseases among children. The program involves daily supervised handwashing, daily supervised tooth brushing with fluoride paste, and bi-annual de-worming through medication(21). The program was developed by the Department of Education Central Office and the Philippine National Institute of Health. However, the program is aided by collaborations with European organizations and Universities, such as German Development Cooperation (GIZ) and University of Jena in Germany (23).

Implementing school health programs requires a clear understanding of the roles and responsibilities assigned by government agencies to the health and education sectors. In the case of "Fit for School," the program is launched within the education system (i.e., schools), while the health department is responsible for financing and procuring the required materials. While children are the direct beneficiaries, the involvement of teachers and the community is crucial for the program's success(21).

The health department provides toothbrushes and fluoride paste, but teachers and the community are responsible for ensuring access to water and supervision. Guidelines are provided to schools, and teachers supervise and implement them. Each class has a health corner where students can store their toothbrushes and necessary materials for maintaining good health. Teachers play a crucial role in the program's success, but children also have an important role. They are given the responsibility of developing their leadership skills and are encouraged to participate in daily handwashing and tooth brushing as a group with their classmates. Children and teachers have distinct responsibilities and must work together as a unit to ensure the program's success. The different roles of the participating parties are outlined in Figure 3(21):

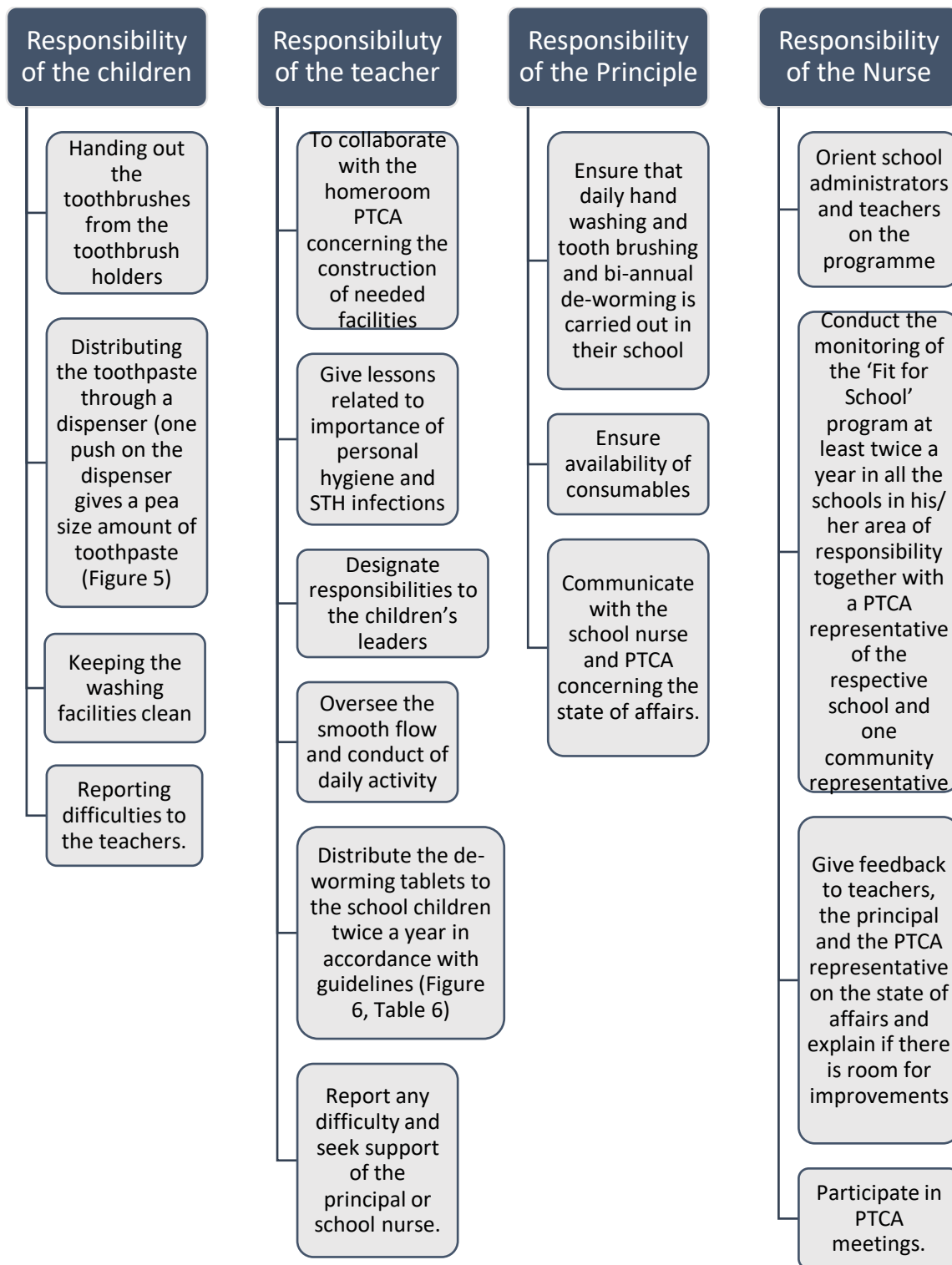


Figure 3: An outline, indicating the roles and responsibilities of the different parties involved in the "Fit for School" program. The diagram lists the roles of the children, the teachers, the principle, and the nurses(21).

Perhaps, the interworking of the different groups is what enables the “Fit for School” program to be successful. Apart from achieving its main objectives, the program also addresses additional points, leading to improvements in health. For instance, in the Philippines, nearly half the schools do not have access to water, which is a requirement for toothbrushing and handwashing. Due to the mandates required by the program, the government places a greater focus on addressing the needs of the schools. With an increased budget, the sanitary needs of the schools are met. Furthermore, the positive results allow policy makers to appreciate the objective of health promoting school programs. This appreciation has led to the implementation of other similar programs, such as banning smoking on school grounds, establishing school gardens, and garbage disposal programs.

1.3 Financing an Oral Health Program

When considering the costs associated with an organization like "Fit for School," it is important to note that many of the people involved are volunteers and readily available. Therefore, the cost is relatively low, as there's no need to hire additional staff. Instead, the teachers who are already present can take on the responsibility of ensuring that students are actively fulfilling their health duties. In addition to human resources, children need toothpaste, toothbrushes, and soap, which costs around 0.5 euros per child per year. Local manufacturers provide toothpaste that meets the required standards. While toothbrushes are typically replaced every 3-4 months, research shows that in the hands of children, a toothbrush is still effective even after 14 months of use. This means that the same brush can be used for the whole year, which keeps program costs low. The financing of different programs depends on the region, and in the Philippines, schools are typically funded by the Municipal and Provincial governments(21).

1.4 Impact of the “Fit for School” Program in the Philippines

Since its introduction into school programs in 2009, the “Fit for School” program has produced some positive and promising results in the Philippines. Bella Monse, et, al. followed a longitudinal cohort study to analyze the impact that the Fit for School program has had on children in the Philippines. The program was titled “The Fit for School Health Outcome Study (FITHOS).(23)” It was a survey financed by GIZ and conducted by the local institutions in the Philippines(23). Its general aim was to study the health-related parameters, and the type of impact that “Fit for School” has had on them. The measured parameters included quality of life, absenteeism from school due to illnesses such as caries, and school performance. The study followed a group of students in the experimental group currently following the Fit for School model, and a control group, not undergoing any healthy living programs(23). Measurements were taken at the baseline, and yearly for a period of four years. The data which was collected showed that the mean body mass index (BMI) in the experimental group had increased, whereas in the control group, it had remained unchanged. Both groups had a decrease in soil-transmitted helminths (STH) infections; however, the decrease was significantly more pronounced in the experimental group. Regarding caries and dental infections, there was a smaller increase of decayed, missing, and filled tooth surfaces (DMFS) and consequences of untreated dental caries, which are pulp, ulceration, fistula, and abscess (PUFA) indexes in the experimental group in comparison to the control group. More specifically, the prevention of increases in these indexes was 17% in the control group but 42% in the experimental group(23). This figure indicates that there is a greater chance of prevention against new caries in the experimental group. Despite the limited sample size, and the short duration of the study, FITHOS demonstrates the value of the Fit for School program. After only one year, the positive results indicate reduced STH infections and increased BMI, associated to daily handwashing and biannual deworming. In addition, daily toothbrushing has further contributed to the increased BMI, as well as reduction in the prevalence of caries(23). Table 1 makes a clear listing of the data that was collected.

Table 1 Mean (\pm se) baseline data, 1-year data, and incremental data for experimental group and the external concurrent control group

Indicators	Experimental group 1			External concurrent control group (C1)			Difference between increments (p-value)
	n=168			n=173			
	Baseline	1-year	increment	Baseline	1-year	increment	
Mean BMI	14.70 (0.11)	14.88 (0.13)	0.18 (0.06)	14.65 (0.11)	14.62 (0.11)	-0.03 (0.05)	Student-t p<0.01
Prevalence of below normal BMI	29.2% (3.5)	27.8% (3.5)	-1.4%	31.8% (3.5)	37.6% (3.7)	5.8%	Chi-square NS
Prevalence of moderate to heavy STH infection	17.2% (2.9)	10.7% (2.4)	-6.5%	32.0% (3.5)	17.3% (2.9)	-14.7	Chi-square p<0.001
Mean DMFS in permanent first molars	0.82 (0.12)	1.54 (0.17)	0.72 (0.10)	1.12 (0.16)	1.99 (0.24)	0.87 (0.14)	Student-t NS
Mean PUFA in permanent first molars	0.060 (0.02)	0.137 (0.03)	0.077 (0.02)	0.087 (0.03)	0.220 (0.05)	0.133 (0.03)	Student-t NS P = 0.068

Table 1: Data collected from a longitudinal study, analyzing the results of the “Fit for School” program in the Philippines between the experimental group and the control group(23).

1.5 Impact of the “Fit for School” program outside the Philippines

Childhood caries are amongst the most common diseases in developing countries. The lack of research, resources and intervention has allowed the problem to aggravate. The induction of the Fit for School program in the Philippines resulted in successes that had not been seen very often in such countries. As indicated earlier, Fit for School demonstrated immediate results from its early stages, and showed promise for greater improvements with its expansion. The impact that Fit for School had made was easily recognizable, as it received awards from the World Bank, United Nations Development Program as a program that had a winning solution, also from the World Health Organization for its Innovation in Global Health(24). This success allows the program to become a model and a standard for other countries to follow suit and implement similar functioning initiatives to improve oral health education in their respective countries. The foundations of the program that have made the program to prosper are the low costs of the program. It is estimated that the program costs about 50 cents per student, which is affordable for even governments with very limited resources. Another factor that allows the program to be successful is that it reaches children through schools and takes advantage of educators and community members that can guide and monitor the children daily. When Fit for School was initially launched in the Philippines, it catered to more than 600,000 students, with plans to reach more than 6 million within 3 years(4). As of 2019, nearly 15 million children had been reached by the Fit for School program across several countries in Asia(25). Some other countries that followed the steps

of the Philippines in implementing the Fit for School program are Cambodia, Indonesia, and Lao PDR. All the countries which implemented the program suffered with increased levels of oral diseases amongst children. Check-ups indicated that between 79% and 98% of the children presented tooth decay. Data demonstrated that in the countries that used Philippines as a guideline and incorporated Fit for School, between 17% and 38% of new caries was prevented. These figures are displayed in Table 2(26).

Oral health indicators	Philippines		Cambodia		Indonesia		Lao PDR	
	EHCP	Control	FIT	Control	FIT	Control	FIT*	Control*
Mean increase in number of decayed, missing, and filled permanent teeth (DMFT) per child	0.67	0.88	0.82	0.99	0.35	0.46	0.26	0.41
Percentage of new caries prevented (%)	24 %		17 %		24 %		38 %	

Table 2: Data comparing the oral health parameters between the control group and the study group under the Fit for School program in the Philippines, Cambodia, Indonesia, and Lao PDR(26).

The results are further confirmed by a longitudinal study conducted by Dujister et, al. In the study, 1847 school children between the ages of 6-8 were followed for two years and compared to control groups. The results indicated that amongst the children, those in the study group displayed on average a 24% reduction in the prevalence of caries(27).

Beyond the statistics, and the percentages of caries prevention and improvement in oral hygiene, the incorporation of the Fit for School program has had a tremendous positive impact on the quality of life. Children are healthier, they are more physically active, and they are present and more engaged socially. Caries is amongst the primary reasons for school absenteeism. Thanks to the incorporation of the Fit for School program, and other initiatives that follow a similar model, absenteeism is reduced by 21% to 58% (27). Higher attendance directly benefits the students as it allows for greater academic scores and improves the social lives of the children. This also benefits the parents, as they do not need to miss time from work to care for their kids who are ill.

DISCUSSION

1.1 Using “Fit for School” as a model organization

As evident by reviewing several research articles, there is a great disparity in the oral health of children in developed countries versus those in developing countries. Due to several factors, such as lack of infrastructure, shortage of qualified members of the dental community, limited funding and resources, limited access to medical centers, and socioeconomic barriers, developing countries lack the dental education that is vital to healthy living. Combatting the lack of education is a multidisciplinary task. The involvement of parents, governments, schools, Non-Governmental Organizations (NGOs) are vital to improving the oral health in developing countries. NGOs particularly serve an important role as they provide funding to different areas to try and overall health of the intended population. In addition to funding, they also train and equip the staff, they provide patient outreach, collaborate with different organizations and groups, and advocate on behalf of specific people to create policy changes, and provide more aid to people.

There have been many initiatives around the world to attempt and reduce the burden of oral diseases in developing countries, however, not all achieve a level of success that is necessary to create change. One organization that has had an adequate impact is “Fit for School.” Evidently, a great part of the “Fit for School” program’s success stems from its simplicity in delivering a working model to children and a low burden of cost that can be managed by even the poorest countries. Children are provided with the resources they need and are tasked with the responsibility of following certain guidelines individually and in a group setting to improve their oral health. Other countries have followed the same model applied in the Philippines through the Fit for School program and have seen similar positive results. The extensive research behind the successes of the Fit for School model gives me reason to believe that designing a similar organization can provide aid and similar results to other parts of the world that also lack the funding and resources to provide adequate dental education and oral health.

1.2 Developing an Oral Health Program

1.2.1 Background and justification

Developing countries are plagued with health conditions that affect its communities. Often, certain diseases such as diarrhea, respiratory problems, and oral diseases are so common, that they are normalized(3). In comparison to developed countries, underdeveloped nations do not have the resources and professionals available to dedicate towards an established health program. Developed countries contribute a large portion of their budget towards preventive programs, educating their communities on the importance of maintaining a healthy life. In contrast, developing countries lack the preventive component in their health programs. Rather, the health program in such countries is merely interventive and consists of emergent treatments(19).

Oral diseases have a greater prevalence in developing countries as opposed to developed nations. The level of oral hygiene that a person has reflects in a great manner the overall health of a person. Studies have demonstrated that oral diseases and an abundance of oral bacteria can lead to other health complication such as cardiovascular diseases, endocarditis, pneumonia, and complications during pregnancy(3). One of the leading factors behind the diminished status of oral health in many of these countries is the lack of education on the topic of oral hygiene, as well as the lack of resources. The objective of Healthy Smiles is to allow children in developing countries to be educated on the topic of oral hygiene and supply them with resources that will allow them to maintain good oral health to reduce the prevalence of diseases.

For decades, Iraq has been a country that has battled with war, poverty, and sickness. Due to the unsafe conditions of the country, survival has become the only concern of the people, while their health and education is placed on the backburner. A recent study, conducted by Mirza Murad Khudeda and Anees Mahmood Midhir looked at the prevalence and severity of dental caries in 6-12 year old children in refugee camps. The results concluded that in

these children, the DMFS scores are higher than the global standards which are set by the World Health Organization(28). For such reason, Iraq was selected as the country in which an organization, similar to Fit for School, would be launched in.

1.2.2 Prioritization of oral health problems

Oral diseases are some of the most common types of chronic illnesses around the globe. This figure is much greater in developing countries such as Philippines, Iraq, India, and Eritrea. Dental caries is highly prevalent in school children. This disease has a great negative impact on many aspects of their lives. Having a disease-free mouth enables children to freely socialize and speak without feeling embarrassed. Having a healthy mouth boosts a child's confidence allowing them to succeed in many aspects of their lives(4). Children who suffer with caries have a lower nutrient intake because the severe pain may prevent them from eating. Studies have demonstrated that children with caries also display a lower BMI and anemia. Complications due to dental caries have shown to be one of the main causes for children missing school days. Such disease not only puts the health of the children at risk, but it also negatively influences their performance at school. Fit for School has a great impact on the children socially and academically. Longitudinal studies demonstrated that the children's mean BMI had increased, and school absenteeism had gone down drastically(23). "The Healthy Smile Project" is an organization which will be initiated in Iraq and aims to emulate similar results to those seen in the Philippines. The educational and preventive aspects of the Healthy Smiles project will attempt to reduce the prevalence of caries in children aged 6-8, improving their overall health, their social lives, and the academic performance.

1.2.3 Beneficiaries

Dental caries is the most frequent chronic disease in many countries around the world. More than 80% of school children in many developing countries present caries. The main goal of "The Healthy Smiles Project" is to improve the oral hygiene of children in developing

countries and reduce the incidence of caries. The main beneficiaries of the program will be school children between the ages of 6-8 years old. The initial country which the program will begin operations in will be Iraq. The organization will work with primary schools, particularly with 6-8 years old because of their high incidence of caries, in said countries due to the simplicity of access, as well as having the guidance of teachers to help them maintain oral hygiene. Furthermore, the children are old enough to understand the importance of oral hygiene, but also young enough to form and establish healthy, long-lasting habits.

1.2.4 Design of “The Healthy Smile Project”

“The Healthy Smile Project” will follow the model set by the “Fit for School” program and utilize schools to reach children between the ages of 6 and 8. The project will look to provide educational materials to students and educators to teach them the importance of oral hygiene. Furthermore, the project will provide fluoride toothpastes, and toothbrushes to the children. With the help of the educators, the children will be required to brush their teeth daily in school.

Based on this simple model, within just one-year, positive results were seen in the Philippines and other countries within the region. Oral hygiene improved drastically, as there was a great reduction in the prevalence of new caries, and improvements in DMFS values. To evaluate the results and the effectiveness of the program, the selected group will receive a dental checkup from a qualified volunteer, and the DMFS results will be recorded as the baseline, along with a control group that is not receiving aid from the program at the same time. The students will be checked on a yearly basis, and the results will be evaluated to determine if they have made a positive impact, as it did in the Philippines. If the results are compliant with the initial objective, the project will attempt to expand and reach a greater number of children.

CONCLUSION

1. There is a great disparity in the oral hygiene of children in developed countries versus children in developing countries. There are many factors that play a role in the imbalance. One of the main components is the lack of dental education amongst school children. Organizations such as “Fit for School” aim to combat the challenges of dental education in developing countries, such as the Philippines. A review was conducted to understand why developing countries face a greater challenge when educating their youth.
2. A further analysis of organizations such as “Fit for School” was made to understand the steps that such NGOs have made to reduce the number of oral diseases and educate children on oral hygiene. Based on the gathered data, the model of “Fit for School” was used to emulate a similar organization to educate the children of Iraq about oral health.

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