

Barriers and enablers to the implementation of school-based obesity prevention strategies in Jeddah, KSA

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ABSTRACT

Introduction: Despite schools' recognised role in mitigating childhood overweight, many schools fail to implement physical activity or nutrition strategies. The current study explored the enablers and barriers to implementing obesity prevention strategies in Jeddah, KSA.

Methods: This research is based on 14 semi-structured interviews with intermediate school principals and sports teachers to gain insight into their perception of barriers and enablers to implementing obesity prevention strategies. Themes were deductively generated from the data.

Results: Participants estimated the prevalence of overweight and obesity among their students to be between 3 and 15% with an increasing trend, particularly among female students. Participants identified five categories of barriers to implementation of obesity prevention intervention: curriculum; schools strategies promoting healthy weight; lack of resources; student's lifestyle; and a lack of teachers in nutrition and sports. School regulations, staff and sufficient resources were the most frequently reported enablers. Participants also identified food services, awareness, and partnerships as barriers and enablers.

Conclusion: There is a need for better infrastructure and financial support for schools and professional development opportunities for teachers from the Saudi Ministry of Education. The Ministry also needs to support the development of multilevel health promotion strategies at school and home and reach out to the broader community.

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1. Introduction

Childhood obesity is one of the biggest public health concerns both globally and in Saudi Arabia, with Middle Eastern countries reporting some of the highest rates of overweight and obesity (NCD Risk Factor Collaboration, 2017). In the Kingdom of Saudi Arabia (KSA), there is no national data available for the prevalence of obesity and overweight for children and adolescents, with studies that have been conducted reporting varied ranges of prevalence. One study of secondary schools students aged 14–19 years (N = 2908) reported the prevalence of obesity to be 24.1% and 14% among males and females respectively and overweight to be 19.5% among males and 20.8% among females (Al-Hazzaa et al., 2014). Another study of KSA children and adolescents from 5 to 18 years of age found the prevalence of overweight among school-aged children (5–12 years) to be 19.6%, and among 13–17 year-old adolescents to be 26.6% (El Mouzan et al., 2010). A systematic review of studies investigating the prevalence of overweight and obesity in Saudi adolescents indicated the prevalence of overweight/obesity was high among younger adolescents

and continued to increase with age (Habbab & Bhutta, 2020).

Childhood obesity is acknowledged as a risk factor for adult chronic disease and has significant impact on both physical and psychological health (Sahoo et al., 2015; Sanders et al., 2015). Overweight and obese children are likely to remain obese into adulthood and more likely to develop non-communicable diseases such as diabetes and cardiovascular diseases at a younger age (Sahoo et al., 2015). Additionally, the most widespread consequences of childhood obesity may be psychosocial such as social stigmatization, bullying, poor self-esteem and discrimination (Gidding et al., 1996; Rankin et al., 2016). The effects of childhood obesity on morbidity and mortality indicate that effective early prevention and treatment are likely to impact children's health and wellbeing in childhood adolescence and subsequently in adulthood (Smith et al., 2020; Story, 1999).

It is increasingly recognized that a multi-faceted systems approach is needed to address complex persistent public health problems such as obesity (Rutter et al.,

2017). One aspect of this approach is to employ population-wide interventions to address obesity prevention in various settings (Hayes et al., 2019). In this regard, for several reasons, school is considered to be a key organizational setting for public health strategies to mitigate and prevent childhood overweight and obesity (Langford et al., 2014; Rathi et al., 2016; Story et al., 2009). First, the majority of children attend school, where they spend much of their waking time. In addition, schools also offer practical opportunities for children to eat and participate in physical activity, as well as formal (e.g., within the curriculum) and informal (e.g., through peers or teachers) opportunities to enhance knowledge and skills around healthy behaviours (Carter & Swinburn, 2004). A meta-synthesis by Clarke et al. (2013) of 18 qualitative studies within the school setting explored the views of parents, school staff and students on the overall role of the school in preventing childhood obesity and concurred that the school is an important setting for obesity prevention in promoting and providing opportunities for physical activity and healthy eating behaviours. The school setting also provides an opportunity to engage parents (Clarke et al., 2013).

School-based interventions addressing specific lifestyle behaviours to prevent obesity have had mixed success (Kain et al., 2004; Katz, 2009; Mo-Suwan et al., 1998; Peterson & Fox, 2007) which has led to calls for comprehensive approaches to obesity prevention that address multiple levels in schools or in after-school settings (Greaney et al., 2014). Students from schools with comprehensive, coordinated health and nutrition initiatives were generally less overweight or obese, demonstrated healthier eating habits, and participated in more physical activity than those from schools without nutrition programmes (Barroso et al., 2005; Hoelscher et al., 2004).

The World Health Organization (WHO) encourages schools to adopt the Health Promoting Schools (HPS) framework; an eco-holistic approach to creating school environments conducive to health and healthy behaviours, to reduce common health problems and increase the efficiency of the education system (Jones & Furner, 1998). HPS initiatives comprise: (1) health education promoted through the formal school curriculum; (2) strategies to enhance the school ethos and physical environment; and (3) engagement with families and the wider community in recognition of the influence of these on children's health (Langford et al., 2015). This framework has prompted many countries over the last 20 years to implement whole school health promotion and obesity prevention actions such as mandating a minimum accumulated time of structured physical activity, provision of nutritious food, and marketing restrictions (Samdal & Rowling, 2011). However, despite these successes, many schools have failed to implement mandatory physical activity policies (Nathan et al., 2018;

Thompson et al., 2013) or adhere to healthy food and beverage standards (Rathi et al., 2017; Ronto et al., 2020). Considering that most of the studies considering implementation barriers and enablers of school-based obesity prevention intervention have been conducted in high-income western countries (Bennett & Burns, 2020; Nathan et al., 2018; Ronto et al., 2020), it is essential to understand the common barriers and enablers in other international contexts. To our knowledge, there is no study identifying factors which hinder and/or facilitate the implementation of school-based obesity prevention strategies in Saudi Arabia. This study qualitatively explores barriers and enablers to the implementation of comprehensive school-based obesity prevention strategies perceived by schoolteachers and school principals in Jeddah, KSA.

2. Method

This qualitative study is part of a broader mixed methods study (Almutairi et al., 2021). An interpretive qualitative approach utilizing semi-structured interviews was employed to gain insight into the beliefs and perspectives of school principals and sports teachers around barriers and enablers to implementing obesity prevention interventions. An interpretive approach allows stakeholders to provide an active voice (Denzin & Lincoln, 2005; Liamputtong, 2013). The conceptual base for the broader study and the qualitative phase of this research was a socio-ecological model (SEM) approach which recognizes the complex interactions between individual, interpersonal, organizational, community and societal factors. Major tenets of the SEM postulate that the health and health behaviours of individuals are connected to the environment, and that health cannot be explained without understanding the environment within which individuals exist (Golden & Earp, 2012; Mcleroy et al., 1988; Townsend & Foster, 2013). The semi-structured interview guide was informed by the literature (Howard-Drake & Halliday, 2016) and included questions exploring perceived barriers and enablers to implementing obesity prevention interventions in schools in KSA. The interview guide was pilot tested with a small sample ($n = 5$) of Saudi teachers not involved in the study.

There are a total of 262 Intermediate government schools within six geographical regions in Jeddah city. The broader study randomly selected and recruited six schools (one school from each region), (Almutairi et al., 2021). The final sample included seven schools as one school initially declined, then decided to participate. A detailed information sheets was provided and the principal investigator (NA) met with the principals of the seven intermediate schools (four male schools and three female schools) and discussed data collection and interview procedures. Upon receiving permission, one-on-one semi-structured interviews

with sports teachers and principals were conducted by the principal investigator online (due to COVID-19 restrictions) at a time convenient to school staff. Each interview took between 20 to 30 minutes.

The study was approved by the Curtin University of Human Research Ethics Committee (HR2020-0337) and permission was granted by the KSA Ministry of Education.

3. Analysis

Thematic analysis was employed to guide the research analysis. The interviews were digitally recorded, transcribed verbatim and translated with an audio converter from Arabic to English. They were then reviewed by the researchers and a the lead author who is bilingual to ensure dependability and determine credibility (Sutton & Austin, 2015). The qualitative data classification and analysis were managed using software package NVivo 12. The principal researcher created one file for each school and imported all transcripts to relevant files. Initially, the researcher read and reread transcripts three times to immerse himself in the data and familiarize himself with it. The researcher then generated initial codes guided by relevant theory and literature and then by sorting the data into clusters, subthemes and themes that represented patterns of shared meaning (Braun & Clarke, 2019). Themes and subthemes were discussed with the research team until consensus was achieved.

4. Results

Fourteen school principals and sports teachers participated in interviews (seven principals and seven sport teachers; one of each from each participating school). Three clusters were created to manage common themes and subthemes, including (prevalence of overweight and obesity among students, barriers and

enablers). Table I shows the themes, sub-themes and the number of references (associated text segments) related to each sub-theme.

5. Prevalence of overweight and obesity among students

The theme *prevalence of overweight and obesity* described principal and teacher perceptions of this health issue in their schools. Overall, participants (including school principals and sports teachers) estimated the prevalence of overweight and obesity among their students to be between 3 and 15%. Participants generally perceived that the rate of overweight among their students was not a concern. However, many participants, especially those in female schools, expressed their observation of an increasing trend in weight gain among students in intermediate schools.

The percentage is almost not very high, but I notice through my experience that the girls can weigh more than their current weight, and there is a high probability of them entering massive obesity (Female school 1, teacher).

The estimated average level of daily physical activity varied between ten minutes to one hour including the weekly physical education class of 45 minutes; break time; and school assembly. A morning school assembly is held in every school and all teachers and students gather to sing, pray, listen to announcements and undertake five minutes of physical activity. All participants felt this amount of daily physical activity during the school day was insufficient to promote healthy weight among students.

We have a lunch break of 30 minutes plus the morning assembly of 15 minutes, thirty plus fifteen minutes, that's 45 minutes. I mean ... from the whole day,

Table I. Themes and sub-themes related to prevalence, barriers, and enablers.

Themes and sub-themes	Files	References (Associated text segments)
Prevalence of overweight and obesity among students		
Prevalence of overweight and obesity	14	31
Amount of physical activity among student	14	26
Reasons for increasing obesity among student	8	9
Barriers		
Curriculum	14	48
School strategies for healthy weight	14	43
Lack of resources (space, equipment, fund)	14	38
Lack of specialists in nutrition and physical education	8	21
Lifestyle changes	7	13
Enablers		
School regulations	14	57
Staff	14	39
Resources	8	18
Both barriers and enablers		
Food services	14	51 (barriers) 46 (enablers)
Raising awareness	11	34 (enablers) 14 (barriers)
Partnership with other organizations	10	24 (enablers) 11 (barriers)

we can say only 50 minutes or 60 minutes (Female school 2, principal)

6. Barriers

Barriers, for the purposes of this study were defined as any factor (person, place, context, or emotional state) that restricts the implementation of comprehensive school-based obesity prevention interventions. All 14 participants reported a wide range of barriers to the implementation of school-based obesity prevention programmes (237 associated text segments), including: curriculum; school strategies for healthy weight; lack of resources (space, infrastructure, equipment and budget); lifestyle changes among students; and lack of teachers with expertise in nutrition and physical education (see Table I).

6.1 Curriculum

Most participants identified curriculum as the major barrier, particularly in female schools where physical education classes are not scheduled, and teachers responsible for physical activity needed to find free time in the school curriculum to arrange some physical activity. All male schools have one 45 minute physical education class per week. Crowded curriculum and competing with other subjects were considered the reasons for this limited time allocation. The majority of participants reinforced that physical education is still not recognized as an essential component of the school experience in Saudi Arabia. They argued that physical education should be seen as a core subject.

We used to wait for the free class, meaning the class in which the female students have no lesson. The free-class teacher, goes into the yard The students can then jump rope, play with a hula hoop, play basketball ... jog. ... Because the period of each session is 40 minutes, they don't have a lot of time to do many things (Female school 1, principal).

The physical education class is not enough, honestly. One class per week ... is not enough. The morning assembly is a quarter of an hour interspersed with three or four minutes of the sports activity (Male school 1, teacher).

Participants also discussed limitations with the physical education syllabus focusing only on specific sports, including football, basketball, and handball. Many students also prefer specific sports such as football or basketball which discourage teachers and school officials to provide more diverse sport options. In addition, the physical education syllabus does not consider the country's weather and seasonal variations making it uncomfortable for students to participate in some activities.

Physical education teachers are obligated to teach a specific skill per week. I mean, we have a book; this book is for teachers only. The students do not have books. ... The second thing is that we have a program ... the first week you have one thing, the second week you have another thing. In all honesty ...; there is no room for creativity because you are held accountable (Male school 1, teacher).

(For) the whole year – it's winter, it's summer, it's autumn, it's spring, and our sports activities are all the same (Male school 4, principal).

6.2 School strategies promoting healthy weight

The majority of participants discussed the absence of a clear health and wellbeing policy or a whole of school approach to obesity prevention in their schools. Some schools, however, implemented awareness programmes linked to specific dates like the WHO's World Diabetes Day to raise awareness about wellbeing, overweight and obesity. Furthermore, some participants mentioned the Rashaqa Program (Ministry of Health, 2022), which was introduced in 2017 by the KSA Ministry of Health and Ministry of Education. This programme aimed to "reduce the prevalence of obesity among school-aged children and adolescents in some selected schools at a rate of 5% by the end of 2020." Strategies included encouraging schools to implement awareness activities,, to provide a supportive environment and enact laws and regulations related to healthy food environment, and mandatory physical activity. However, participants in this study noted that these programmes and activities were often unrealistic and did not match with the school's capacities and capabilities, resulting in only partial or non-implementation.

There is the implementation of the school health program, the World Day of Healthy Food, the International Day of Obesity, these are among the activities and programs that appear in schools' operational plans ... A school can develop their own program that addresses and reinforces this issue (Female school 1, principal).

I mean, there are people in offices who just issue a decision, but it is not based on reality. ... it is always preferable for the people who make decisions to be people ... in the field who practice the profession and see the difficulties. But when people are just managing strategies, planning and development without going into the field for implementation on the ground, we will not reach the result we want (Female school 3, teacher).

6.3 Lack of resources (environment, equipment, and funding)

Most participants reported they did not have access to standard facilities like spacious grounds, well-equipped gyms, or separate places for outdoor and/

or indoor activities. Many revealed that their school's yard was quite small, so students were only able to participate in simple physical activities and movements like jumping and running, which provide limited opportunity to impact health and fitness. Moreover, for some schools the buildings are rented, and they do not adequately accommodate the number of students nor are they designed for educational purposes.

They allow us to exercise or practice sports in the schools, but ... There is no suitable environment for the female students to play sports. Our courtyards are narrow, ..., the classes are also narrow, and therefore there is no space (Female school 3, principal).

The building we have is a non-government building, a rented building ... the environment of the playgrounds is different from the environment of the government school buildings in terms of the playground, in terms of the sports equipment ... (Male school 3, teacher).

Most participants noted that their schools do not have adequate standard sport and recreational equipment. In some schools, staff personally purchased some limited basic sports equipment like balls. Participants expressed concern that this meant they did not have enough equipment to conduct meaningful activities. Further, they agreed it should not be the responsibility of staff to provide this equipment.

Our physical education teacher pays from his own pocket. I mean, he buys things like balls; for example, he buys sports equipment, pays for them out of his own pocket. Therefore, this is also one of the obstacles that we have not gotten a quick response to (from the Ministry) (Male school 3, principal).

Many participants discussed funding as a barrier, such as an insufficient general budget from the Ministry of Education to provide equipment and suitable places for exercise; spending of designated limited sports budgets for other subjects; and the absence of subsidies or grants for healthy foods within the school environment.

There is no allocated budget (for sports equipment), or its (the Ministry's) budgets are spent on other things that they see as a priority because for many years we have seen nothing (from them) ... It is our self-effort, either from me, or from the school administration, because we have a percentage profit from the school canteen, we use this to purchase things. You buy things that you can afford, cheaper things. As for sports equipment, they are not cheap, they are expensive (Male school 1, teacher).

6.4 Lack of teachers in physical activity and nutrition

Four schools particularly female schools, reported that they do not have specialized physical education

teachers and none of schools had specialized nutrition teachers. Furthermore, some physical education teachers in this study indicated they had insufficient professional training at university in teaching physical education and nutrition, leaving many feeling they lack skills to focus on obesity prevention.

There are no teachers in these fields, either in physical education or in nutrition (Female school 1, teacher)

In general, unfortunately, we do not specialise in the issue of obesity in students. This is in the curriculum of universities and colleges. But when we came to work in schools or in the Ministry, unfortunately, there were no courses and guidelines for teachers, how to manage students in terms of obesity ... Of course, most of the teachers who are successful now, most of them do it with personal diligence. I mean, he searches for the information himself (Male school 2, teacher).

Participants also indicated significant variation between sports teachers in terms of their teaching style. Some teachers were judged to put insufficient effort into their teaching, with some simply providing a ball and letting students do what they wanted. However, some teachers were reportedly very proactive and designed many different physical activities, competitions, and initiatives.

There are some teachers ... especially physical education teachers, who do not give their profession enough dedication ... He is just teaching a class; he gives them the ball and sits in the shade (Male school 4, principal).

He (our PE teacher) was nominated three times for the Jeddah Awards and the Education Award. His projects were very impressive and were very useful for students. I myself benefited from it (Male school 4, principal)

6.5 Lifestyle changes among adolescents

Many participants perceived that students today prefer an inactive, sedentary lifestyle which includes staying at home and watching television, using computers or other smart technology instead of going outside and playing with friends. Some participants stated that in the past, walking to school was common. However, currently travelling by car or public transport to get to school has increased noticeably, regardless of the distance students live from the school. In addition, participants expressed concern around poor nutrition; increasing consumption of fast and processed food; home delivery of cooked meals; and a lack of awareness among students, parents, and the community.

Today's generation does not have that kind of activity, especially at the age of 12 to 15 years. The greatest enjoyment and pleasure in life is in front of the TV, PlayStation, and using a mobile phone, iPad, and

there is no movement. And everything comes to him (Female school 3, teacher).

I have worked in education for more than thirty years. The students of the past are different from students nowadays. I mean, lifestyle changes, the fast-food brands that came out, relying more on transportation than walking. All these things lead to weight gain and obesity (Male school 3, teacher).

The process of delivering food to us has become available on more than one platform (Smartphone app) ... you are at home, sitting comfortably, buying. They come to the door; they deliver to you, telling you to take it (Male school 1, teacher).

7. Enablers

Enablers, for the purpose of this study, were defined as 'any factor (a person, place, thing, context, or emotional state) that facilitate the implementation of a school's obesity prevention interventions. All 14 participants described a wide range of facilitators to providing whole school obesity prevention strategies (210 associated text segments), including school regulation and programmes, staff, and resources (see Table I).

7.1 School regulation and program

Most participants agreed with the need for strategies to promote physical activity and healthy eating; however, they also mentioned that these strategies and programmes only could be beneficial with an appropriate needs assessment and planning before implementation. Evaluating programmes was also seen to be important.

If they prepare a program, without evaluation, it will not be sustainable. I mean, for example, with the morning assembly, there must be sufficient time for it (physical activity). If you (Ministry of Education) say to do a sport, you must give us sufficient time for this sport (Female school 2, principal).

The first step is for the benefit of our students, for the benefit of society as well, and there is a follow-up process. We always do programs and do activities, but we don't follow up. There must be follow-up, reporting, statistics (Male school 4, teacher).

Regulations related to the school canteen and regular supervision of the canteen management to ensure the availability of healthy products have been identified by the participants as useful strategies to reduce students' exposure to unhealthy products. Most participants expressed that their schools should implement a school policy to ban unhealthy food and promote the provision of a greater variety of healthy food options.

For school canteens, we need to change the type of foods available. Because I never consider it healthy and that it actually nourishes the students at all. Also,

when initiating physical activity strategies, we start with physical exercise, with improvements that may be small, but possible if all make an effort and all departments join forces (Female school 1, principal).

Applying strict requirements for the food of students and their drink. Also, the school canteen must provide healthy food in an attractive way to students (Female school 1, teacher).

7.2 Staff

Participants viewed teachers as role models and influential adults for students, in terms of their clothes, appearance, and healthy behaviours, particularly with regard to physical activity and nutrition. It was suggested this could potentially positively impact on students' behaviour by positively guiding students, motivating the students to exercise, and participating actively in the programmes related to obesity prevention.

A student is affected by his teacher more than by his parents at home. I mean, he learns a lot from his teacher. Therefore, if every teacher took some responsibility, urging students to move, to be active, to exercise, to eat healthy foods ... the student would have benefited, and the teacher would have had an impact on the school (Male school 3, principal).

7.3 Resources

Many participants discussed allocating enough time for physical education in the curriculum, equipping schools with appropriate tools, and the provision of standard physical activity spaces are essential in promoting healthy weight among students.

My recommendation ... is actually allocating classes and lesson plans and providing them with equipment and organised supervision and follow-up (Female school 1, principal).

We have a large yard. We made a walking track for them, about five hundred meters long ... if he took two laps, he would walk a kilometre. And we awarded prizes ... to motivate them ... we made an outdoor gym. This idea I took from what I saw in America. We put them on sports equipment outside the yard throughout the day. The students use them from the time they leave (class), so you find them, all the time playing walking and moving (Male school 4, teacher).

Some participants discussed the inclusion of formal and informal sports competitions and fitness activities were useful for motivating students to be active and to cooperate with other classmates.

We also work in the field of school health, conducting periodic competitions. Also the sports teacher ... has very a wonderful program that includes not only football ... but exercises, fitness, competitions ...

motivating students who take the initiative and participate in sports activities. (Male school 2, teacher).

8. Both barriers and enablers

8.1 School food policy

Almost all participants agreed that the role of the school canteen is essential in promoting students' diet and healthy weight. However, some participants discussed the school canteen to also be a potential barrier due to the provision of unhealthy products such as chips, croissants, juices, and sugary sweets. Despite contractual agreements between school officials and canteen managers to sell healthy food, they sometimes offer unhealthy food and beverages. Many participants suggested the school canteen should offer more healthy choices such as vegetables, fruits, and wholemeal bread. Bringing food from home was also mentioned as a barrier, as many students bring unhealthy food to school. Some schools try to restrict the type of food students bring to school by forbidding unhealthy products like soft drinks. In addition, almost all male and female schools have reportedly implemented policy to monitor students during the break or lunchtime to assess what they are eating or bringing from home. However, the frequency of supervision and the processes involved were reported by the participants as varied. Some reported school responses to include confiscating unhealthy and forbidden foods, recording foods and contacting families. Participants also reported that the close proximity of outlets selling unhealthy foods (such as supermarkets, restaurants, and bakeries) to schools impedes healthy eating behaviour by students.

The first thing is the school canteen, which sometimes does not sell healthy foods such as, sweets, croissants, etc. All of those things are number one in increasing the weight of the students (Male school 4, teacher).

The female students, unfortunately, when they bring food, don't bring healthy food. What will they bring? They bring soft drinks because they do not want juices and do not want milk. Some of them never drink milk or drink juice (Female school 1, principal).

The students who brought unhealthy food ... they brought baked goods people (students) came to me, and said at 11am the bakery is coming, they are delivering food from outside the school (Male school 4, principal).

(We need) good supervision of the school canteen, so that they do not sell anything unhealthy. They should adhere to the requirements set by the health department in the Ministry of Education. We have health requirements, and these requirements are for the benefit of the students. If the school adheres to those requirements, believe me, it will reduce overweight (Female school 3, principal).

8.2 Awareness

Most participants discussed a lack of awareness about healthy food and the importance of physical activity among students, parents, teachers, other school staff, and the broader community. Some participants also discussed the reliance on treatment as opposed to prevention. For example, some participants noted that the availability of gastrectomy and weight loss surgeries influences adolescents and their families from acting to prevent overweight and obesity.

The family in the home has its way of living, they do not care about physical activity, or that they should have an hour a day out of the house walking or jogging ... If you do not give him an hour of physical activity, you will see that he turns against you at home, his mood changes. He must channel this energy into something useful to end his day in a great mood. This is a barrier. (Male school 4, principal).

We put the idea of sleeve gastrectomy operations in this category ... that we eat as we want at this stage and then we have a second stage when I want to be thin. So, I can have a sleeve gastrectomy operation. They don't think about sports, nor healthy food, just think about sleeve gastrectomy (Female school 1, teacher).

Almost all participants considered awareness as an important enabler for healthy weight. Raising awareness among students, their families, and society about obesity and its consequences was considered important at an individual and a societal level. The teacher's role in raising awareness about healthy diet and physical activity regularly was highlighted.

The students need awareness, and it must be from two sides ... from the home first, and the school second, or vice versa. But the two must complement each other. If she is a student or if she is a girl, you must raise her awareness of obesity, of course, because they are still young, we must talk to them in a way that they can understand (Female school 2, principal).

Awareness is very important, I mean from all teachers, not just the physical education teacher. If every teacher takes from his class, for example, five minutes ... and urges them to do the right healthy things, I think that it is a very appropriate thing (Male school 3, principal).

One participant talked about using social media to increase awareness among students and their families. The participant noted that given the important role played and the amount of time adolescents spend using social media, promotion of active and healthy lifestyles via social media could be a promising initiative. Inviting successful athletes in the neighbourhood and asking them to speak about their daily programme, diet, and lifestyle was also seen to be a beneficial programme component.

We take photos of the students and upload them on our website, and we also have an Instagram account (called), 'The students are active'. In addition, we download motivational videos from many social media, such as WhatsApp and Instagram. In addition, we post fitness advice that they use throughout the day. (Male school 4, teacher).

They invited a group of athletes to the secondary school next to us, and they played a great role. ... many students were affected by them because they showed them their complete daily program, how to get the right nutrition, how to establish a sports program such as walking, such as participation in the neighbourhood clubs, and healthy sleep. They showed them many things, and by God, many students benefited from them and applied them in practice (Male school 3, principal).

8.3 Partnership with other departments or organizations

Some participants discussed the lack of coordination between school, students, parents, and the Ministry of Education as a barrier. They highlighted that the complex issue of adolescent obesity and overweight requires a collaborative approach to solve or mitigate the problem. Some participants suggested that school space and facilities limitations could be mitigated by effective cooperation between schools and other neighbourhood organizations such as sports clubs, sports academies, or university and college sports centres. Working with clubs and available sports facilities ensures students would have access to high-quality sport and recreation programmes and facilities. Moreover, some participants illustrated how partnerships with well-known professional clubs in the city has created a high level of motivation among students and encouraged them to exercise professionally.

There is no cooperation, in all honesty, no cooperation. Few of the parents bring children and say, I want you to let him move, I want you to let him play, I want you to let him run The majority will criticise you if you do something like this with a group, and you will receive criticism even though it is at the heart of our work, but it is strange that he (parent) criticises you (Male school 1, teacher).

Sports clubs, sports centres, or even centres in universities and colleges. They can be partners for us because they have ... spaces that have resources, people and equipment. This community partnership would enable these strategies (for the students) to reach a healthy weight, to reach a healthy mind in a healthy body (Female school 1, principal).

We have almost three students who participated in the Roman wrestling; one of them on the Kingdom (national team) was in partnership with Al-Ahly Club. In fact, they came and took a group of our students for physical education, and as I told you, one of them rose to the Kingdom level in Roman wrestling and they supported him. Their partnerships were beautiful

and fruitful and motivated the students (Male school 1, principal).

Coordination between school, parents and adequate support from the Ministry of Education was viewed as an important enabler in promoting healthy weight. In contrast, nearly all participants reported their school to lack a clear plan to engage families in school obesity prevention programmes. Coordination with companies that provide healthy products and allow them to introduce their products at the school was mentioned as a facilitator to encourage the student to take a healthy diet and be familiar with healthy options.

The parent is the most important, and then the Ministry of Education, and also the Ministry of Health is considered an essential partner. I mean, the interplay among the three is very important (Female school 3, principal).

We have companies that specialise in dairy and specialise in types of well-known premium juices that are should be invited to schools to conduct seminars ... and bring samples with them and show the students that this is healthy and this is better food (Male school 1, teacher).

Health centres were also mentioned by participants as an important contributor to school health by providing annual investigations of students' health, conducting follow-ups, and presenting lectures and seminars.

We have a specialist for the government clinic, there is cooperation between the Education Department and the neighbourhood clinic. Each semester he comes twice, measures the weight of the students, measures their height ..., calculates the BMI, and shares the information (Male school 2, principal).

9. Discussion

Schools are an excellent setting within which to promote physical activity and nutrition given the amount of time students spend in this environment, the possibility of supportive school curriculum content, along with opportunities within the school ethos and environment and via parent and community engagement. However, despite moderately strong evidence and advocacy for the effectiveness of school-based interventions for preventing childhood obesity (Singhal et al., 2021; Wang et al., 2015), prevalence continues to rise (Abarca-Gómez et al., 2017), and many schools fail to implement supportive policies around physical activity and healthy nutrition (Fletcher et al., 2014; Måsse et al., 2013; Thompson et al., 2013). Findings from this study identified factors (barriers and enablers) that may influence the implementation of obesity prevention interventions in intermediate schools in Saudi Arabia.

Barriers to implementing obesity prevention interventions in Jeddah, KSA were mostly related to curriculum, school environment and organization, for example, limited curriculum focusing on healthy eating and physical activity, lack of school facilities for physical activity, equipment and resources, lack of comprehensive and clear strategy, and insufficient specialists in physical activity and nutrition. School environment and resources have been identified as major inhibitors in both qualitative and quantitative studies (Day et al., 2019; Nathan et al., 2018; Rathi et al., 2017, 2018; Schuler et al., 2018). An Australian study also found the greatest perceived inhibitors to implement effective physical education to be institutional factors, such as lack of time, professional development and equipment (Morgan & Hansen, 2008). Furthermore, a study of 36 intermediate schools in US, found 53% of school's principals reported lack of funding and indoor facilities as the main barriers in providing a quality physical activity programme (Young et al., 2007). Most schools in the current study had limited space, insufficient equipment, and a constrained budget. Partnering with other schools, neighbourhood clubs and sports facilities, and universities may mitigate the limitations to enhance physical activity inside and outside school time. Teachers may also have opportunities to develop or enhance partnerships with local physical activity and wellness programmes to create opportunities for students to be active outside of school (Faber et al., 2007). A systematic review of community engaged interventions focusing on diet and activity demonstrated that a greater degree of community engagement in school-based intervention is linked to greater achievement of intervention outcomes and health outcomes (Krishnaswami et al., 2012).

In this study female participant schools were more likely to identify a greater number of environment and organizations barriers including limited space, insufficient resources and equipment, and greater shortage of sports teachers and nutrition specialists. Furthermore, due to differences between girls and boys in responding to the elements of school-based prevention programmes (Amini et al., 2015; Herscovici et al., 2013), the gender differences identified in this study should also be taken into consideration in the KSA context, where there is no specified obesity prevention interventions for girls.

Curriculum-related barriers such as limited time and competing demands, low priority for physical education and lack of diversity in the physical education syllabus were highlighted as impediments to the delivery of effective physical education in this study. Similarly, in Ontario, three main barriers were identified in the implementation of the physical education curriculum: lower priority for health and physical education; lack of performance measures for physical

activity; and lack of sufficient infrastructure. Teachers perceived that low priority for physical education, impacts the quality and quantity of physical education provided (Dwyer et al., 2003).

The study participants identified a number of enablers to implementing obesity prevention interventions also related to school environment and organization, such as school regulations, resources and partnering with other organizations. Schools with better facilities and spaces and adequate equipment were more able to provide physical education and a healthy eating programme. For example, parents in Riyadh City, KSA enrolled their children in private schools with better sport and physical activity facilities because of the important impact of physical activity on children's physical and mental health (Alsauidi, 2015). Availability of resources and funding have also been identified in other international studies as critical factors in implementing health promotion programmes (Brown & Elliott, 2015; Day et al., 2019; Måsse et al., 2013; Usher & Anderton, 2014).

Food environments have been identified as a major contributor to unhealthy dietary patterns (Rathi et al., 2016, 2018; Ronto et al., 2020). Young people consume over one-third of their daily energy intake at schools. Therefore, the food environment at schools, including what food schools offer (e.g., via canteen or vending machine), can significantly impact on children's dietary behaviours (Rathi et al., 2016; Ronto et al., 2020). A schools' policy of monitoring school canteen provisions and students' food choices during lunchtime were described by participants of this study as a positive action to decrease exposure to unhealthy food and beverage. In support of this policy, Bassi et al. (2021) found stringent implementation, regular monitoring and surveillance of the food environment in and around the school to be imperative in promoting sustained healthy eating behaviours in Indian schools.

Student-related barriers such as the prevalence of sedentary lifestyles and lack of awareness and knowledge about healthy behaviours were identified as additional hindrances to implementing obesity prevention programmes. A study of Kuwaiti's student perceptions regarding physical education concluded that physical education did not make a significant impact in the promotion of students' health because "students did not want to do physical activity and were less interested in participating in school physical education and, even more, students have stopped caring about physical education as they have not found progress in terms of health aspect" (Al-Amari & Ziab, 2012, p. 310). Furthermore, in recent times, with the growing utilization of medical treatment and bariatric surgeries for children and adolescents (Kyler et al., 2019; Zwintscher et al., 2013), many young students, particularly female students and their families, are less inclined to pursue

long term-healthy behaviours to reach a healthy weight (Ortiz et al., 2017).

Raising awareness and motivation not only among students but also among parents, teachers, the school board, and the broader community also contributes to the implementation of obesity prevention programmes and encourages more sustainable healthy behaviour among adolescents. Parents and family play a vital and supportive role in the early development of young people, and good outcomes are more likely when parents are actively involved in promoting the health of their children (Barnekov et al., 2006). Schuler et al. (2018) indicated that enhancing support and programmes to facilitate the involvement of communities, school systems, and parents and families may be instrumental in enhancing the implementation of school wellness policy implementation. The WHO Health Promoting Schools initiative recognizes that parent awareness could be improved through school systems, as schools can be an avenue for accessing parents and communities (Jones & Furner, 1998). However, after many years, family and community engagement is recognized as the weakest aspect in the implementation of HPS framework with most studies employing very minimal efforts to engage families (Langford et al., 2015).

To our knowledge, this study is the first qualitative study to explore enablers and barriers to the implementation of school-based obesity prevention interventions in the Saudi Arabian context. Limitations of the study should be considered. As this study had a qualitative focus with a limited number of educational professionals in small number of schools in Jeddah, the findings are not generalizable to all Saudi or Arabic speaking Middle Eastern intermediate schools. The study highlights some differences between male and female schools, however the small sample size precluded rigorous comparisons. Principals and sports teachers were recruited; subsequent studies should consider the recruitment of other relevant teachers, particularly science teachers. Despite these limitations, the findings are useful for other schools, especially those in the Arabic speaking countries.

10. Conclusion

Principals and sports teachers perceive childhood overweight and obesity to be an increasing concern among intermediate school students in KSA and recommend the implementation of comprehensive obesity prevention interventions in school settings. However, schools are faced with significant organizational barriers including the lack of sufficient resources (facilities, equipment, and budget), curriculum constraints, the low priority given to health and physical education, and insufficient nutrition and physical education specialist staff. To

facilitate this, the Saudi Ministry of Education should consider greater emphasis on physical activity and nutrition included in university education degrees; opportunities for ongoing professional development for teachers; greater emphasis on physical education and nutrition in the school curriculum; financial support for schools to ensure adequate equipment; and support for schools to develop and implement school-based policies and programmes. School staff should also be supported to partner with other community organizations to increase community capacities and capabilities and mitigate resource constraints.

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Data availability

The data that support the findings of this study are available on request from the corresponding author.

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