

# Childhood Obesity and It's Association with Physical Activity in Saudi Arabia: A Systemic Review

Sarah Alqurashi, Noura Eid\*

Faculty of Applied Medical Sciences, Department of Clinical Nutrition, King Abdulaziz University, Jeddah, Saudi Arabia

\*Corresponding author: [sh.alqurashii@gmail.com](mailto:sh.alqurashii@gmail.com)

Received November 12, 2018; Revised December 22, 2018; Accepted January 15, 2019

**Abstract** Childhood Obesity is a major problem worldwide. In Saudi Arabia the childhood obesity has an upward trend compared with past tow decade. Appropriate activity engagement of children and adolescent in sports and physical activity is a fundamental goal of obesity prevention. This Review highlights the lack of current evidence of physical inactivity and its relation with high prevalence of obesity among Saudi children. Thus, recommendations to attempt strategies and policies to enhance the physical activity level in the society of Saudi Arabia is discussed.

**Keywords:** *childhood, physical activity, inactivity, obesity, saudi Arabia*

**Cite This Article:** Sarah Alqurashi, and Noura Eid, "Childhood Obesity and It's Association with Physical Activity in Saudi Arabia: A Systemic Review." *American Journal of Food and Nutrition*, vol. 7, no. x (2019): 1-5. doi: 10.12691/ajfn-7-1-1.

## 1. Introduction

Childhood obesity is one of the major public health concerns in the 21st century, where a significant increase in the prevalence of childhood obesity from 4.2% in 1990 to 6.7% has been seen in the year 2010. This trend is expected to reach 9.1% in 2020 [1]. According to the World Health Organization (WHO), there are 41 million children in 2016 under the age of five who were overweight or obese [2]. The Childhood obesity prevalence in Saudi Arabia has an upward trend compared with past tow decade [3,4]. In 2005, the prevalence of childhood obesity and overweight were 23% and 9.3% respectively. According to Al-Hazzaa [5], Saudi children nowadays expend less energy in their daily activities compared with their counterparts three or four decades ago. Obesity is a multifactorial disease [6]. It reflects complex interactions of genetic, metabolic, cultural, environmental, and behavioral factors [7]. The imbalance between nutritional intake and level of physical activity as consumption of that number of calories will eventually lead to obesity. The benefit of Physical activity during childhood is not limited to the prevention of obesity as the role of physical activity (PA) in preventing or delaying metabolic complications such as diabetes, cardiovascular disease, and hypertension is recognized [8,9]. Physical Activity also showed improvement in bone mineral density, increased school performance, and had a positive effect on the mental health [10,11,12]. In Saudi Arabia Physical inactivity is high among all ages, in 2004 the overall prevalence rates of physical inactivity among Saudi children, youth and adult were 60%, 70%, 80% respectively [13]. It is important to highlight the fact that there is limited evidence of the current level of physical activity among Saudi children. most of the

current studies are not enough to give a clear picture of the current situation among Saudi children [14,15,16]. The economic changes in Saudi Arabia in recent years had high impact in obesity and physical inactivity along with many environmental factor [17]. This Review provide an overview of the relation of physical inactivity and obesity in children, it also seeks to discuss the current evidence available about childhood obesity and physical inactivity among Saudi Children as well as to discuss strategies that can potentially improve the physical activity level and enhance the overall health statue among them.

## 2. Epidemiology of Childhood obesity in Saudi Arabia:

Childhood obesity is one of the major public health concerns in the 21st century, where a significant increase in the prevalence of childhood obesity from 4.2% in 1990 to 6.7% has been seen in the year 2010. This trend is expected to reach 9.1% in 2020 [1]. According to the World Health Organization (WHO), there are 41 million children in 2016 under the age of five who were overweight or obese [2]. If current trends continue the number of overweight or obese children globally will increase to 70 million by 2025 [18]. The National Health and Nutrition Examination Survey (NHANES) in 2013-2014 estimated that 17.2% of children and adolescents in U.S aged 2–19 years are obese and 16.2% of them are overweight [19]. While in United kingdom 9.3% of children aged 4-5 years in 2015 were obese, this result was higher than the previous year, which was 9.1% [20]. The high prevalence of childhood obesity was also found in the Middle East region, with a 15%-45% of the adolescent in this region are considered overweight or obese [21]. In Saudi Arabi, a national surveillance for

childhood overweight and obesity was conducted in 2005 involving children aged 5-18 years old showed overall prevalence of overweight were 23% and 9.3% were obese [22]. While in a recent Study, the Arab Teen Life Style (ATLS) showed the prevalence of obesity among children aged 14-19 years old was 14% and 24.1% for female and males respectively [23]. Reports have been showing the prevalence in Saudi Arabia has an upward trend compared with past tow decade [3,4]. In one study the prevalence of obesity increased seven times among Saudi school boys age 6-14 years during 1988 and 2005, (from 3.4% to 24.5% respectively) [4]. The distribution of overweight and obesity among Saudi children are found in all provinces [24,25]. Based on Elhazmi study [25], the prevalence of obesity among Saudi children placed intermediate comparing to other population, where it has a prevalence of less than that found in children from Germany, United States, South Africa, Italy and England but higher than that in China and almost similar to that in North-western and Spain [25]. Report from one study involved 7056 Saudi children (aged 2–18 years) shown that obesity in both sexes is low among preschool children (31%) and highest among adolescents (50%–76%) with the peak of obesity at age 10–13 years (28.0%) and stayed at the same high rate until age 14–18 years. It also showed the overall rate of obesity were higher among male than female ( 24.4% vs 19.3% respectively) [26]. This finding was similar to the ATLS Study were male had higher prevalence of overweight and obesity compared to female (43.6% vs 34.8% respectively) [23]. This high prevalence of childhood obesity in Saudi Arabia can be explained as a result of the economic improvement over the last 50 years; people have greater affluence, which markedly changed the food consumption pattern and dietary habits [27,28]. Unfortunately, it is difficult to follow up the childhood obesity prevalence in Saudi Arabia and harder to identify the incidence. According to Al Shehri [29], this situation is due to the difficulty access to reliable national data and accurate information about the rates and time trends is not always applicable. These limitations of can contribute to the increase of its incidence and lower the chances of applying an intervention or prevention measures.

## 2.1. The Risk Factors of Childhood Obesity

Obesity is a multifactorial disease [6]. It reflects complex interactions of genetic, metabolic, cultural, environmental, socioeconomic, and behavioral factors [7]. The imbalance between nutritional intake and level of physical activity as consumption of that number of calories will eventually lead to obesity. A balanced diet with the right amount and type of food is important for childhood optimum growth and development [30,31]. The 2015-2020 Dietary Guidelines for Americans recommend that children aged 2 years or older follow a healthy eating pattern that include a variety of fruits and vegetables, whole grains, fat-free and low-fat dairy products [32]. The most recognized risk factor for childhood obesity is parent BMI as well as parent restriction feeding for weight control [33,34]. Other factors were found to have an association with childhood obesity are: genetic [35,36], sedentary behavior [37], night sleep duration [34,38], externalizing behaviors and stressful environment [39].

One study was conducted in Canada involved 5890 children aged 11-16 years showed that physical activity were lower and Television viewing were higher among overweight and obese children compared to normal weight children [40]. In fact, the intensity of physical activity can lower the risk of developing obesity. One study has found children aged 4-6 years who maintained a high degree of vigorous activity were in the lowest quartile for body fat percentage at 3-years follow-up [41]. These finding prove the presence of a bidirectional association of physical activity and sedentary behavior with obesity. Thereby it's important to consider obesity as a factor of decreasing activity as well a potential consequence too. There are some cross-sectional studies conducted among Saudi children in order to assess the risk factors related to obesity, most of them involved small sample of earthier male or female participants only and it represent sample from one region or single city. It is important to mention that's there is almost no national or cohort study was conducted in Saudi Arabia in order to investigate the risk factors associated with childhood obesity. One cross-sectional study involved 1139 Saudi male aged between 10-14 years old in Al-Hassa City showed 9.7% of them were obese and 14.2% were overweight while the risk factors that were associated with the obesity are: infrequent or missing breakfast, frequent fast food consumption, inadequate daily intake of fruit and vegetables with higher amount of sweets and carbonated drinks on daily basis [42]. Another cross-sectional study was conducted in 2017 involved a total of 2027 school aged children in Taif area showed 27.5% of the participants were obese or overweighed, with significant relation between body mass index BMI and regular soft or diet drinks. it also showed relation between obesity and family income as children from high socioeconomic area were more obese compared to other areas in Taif city [43]. Based on these finding we encourage further nationwide and cohort studies to be conducted to assess the most common risk factors that influence childhood obesity in Saudi Arabi.

### 2.1.1. Physical Inactivity in Saudi Arabia

Children should be encouraged to be active throughout the day since birth [44]. Physical Activity define as “any bodily movement produced by contraction of skeletal muscle (large) muscles that's results in energy expenditure” [45]. The physical activity guideline differs from country to another [46,47,48]. Some countries including Saudi Arabia do not have a National Guideline and they follow the World health organization global recommendation [49,50]. The WHO recommend children aged between 5-17 years old to have 60 minutes (1 hour) or more of physical activity daily [51]. They Recommend most of the 60 minutes a day to be either moderate or vigorous intensity, and at least 3 days a week include vigorous-intensity. Age has an influence on the physical activity type as preschool children tend to be naturally active in an intermittent way [46,52]. while early elementary school children age (6-9 years old) tend to improve their motor skills, visual tracking and balance, it is important to give them flexible rules and focus on the enjoyment part [53]. With children getting older more structured physical activity can be added, with encouraging team play and

enjoyment [46,54]. The benefit of physical activity during childhood is not limited to the prevention of obesity as it has a role in preventing or delaying metabolic complications such as diabetes, cardiovascular disease, and hypertension [8,9]. Physical Activity also showed improvement in bone mineral density, increased school performance, and had a positive effect on the mental health [10,11,12]. Result of United States Report Card on Physical Activity for children and Youth in 2018 showed only 24% of children age 6-17 years met the U.S physical activity guideline [55]. There are minimum number of studies done in order to assess the physical activity level among Saudi children, most of them are involving small sample size conducted in local region. Based on the results from one study in 2005 involved 1454 children aged between 12-19 years old from different provinces in Saudi Arabia, girls were significantly physically inactive compared to the boys [16]. Another study involved 2908 secondary-school students from three different cities in Saudi Arabia in 2010, showed 84% of male and 91.2% of female spent more than 2 hours on screen time every day, more shockingly 56.5% of male and 87% of the female did not meet the daily physical activity guideline [56]. Of course The economic changes in Saudi Arabia had high impact in the low physical activity level and high sedentary lifestyle, along with many environmental factor such as lack of sports facilities, discouraging climate for outdoor physical activity and the public transport system in the cities where the usage of automobiles is required for all trips [17]. Report from one study involved 453 male students aged between 15-18 years old in Riyadh city highlighted to the most common reasons discouraging Adolescents and young adult form being active as 74% of them reported the lack of available facilities in the neighborhoods/community are one of the factors for being inactive and 59% reported the lack of accessible and suitable sports places were one of the reasons. Other factors were shown in the reports are time limitations, lack of friend and encouragement from others, lack of safe sporting places, high cost, not being interested in sports, and ignorance about the benefits of sports [57,58]. It is important to highlight to the fact that in Saudi Arabia physical activity are still not allowed at public schools for girls for all level of education [59]. Several studies have reported associations between parent and child physical activity level. One Study showed parent sedentary behavior was associated with increase in children sedentary time too [60]. While another study showed Increasing parental PA correlate with increased PA in children [61]. In fact, supporting children and engaging them to enroll in lessons or team sports led to further increasing in children physical activity [62,63]. Unfortunately, the awareness of Physical Activity recommendation among Saudi mothers' regarding their children's PA was exceedingly low. As only 2% from mothers in a cross-sectional study were fully aware of children's physical activity recommendations [64]. All of this finding highlights to the important of creating awareness of children's PA among Saudi community and promote the dissemination of the physical activity guidelines to reach larger sections of the population. We encourage future researches to focus on the risk factor of physical inactivity among Saudi children, moreover, we need studies with larger sample sizes and wide

distribution. Schools in particular are an important enjoinment to be studies as almost no study was conducted to assess the level of Physical Education or the current curriculum as well as the effect of physical activity classes on Saudi Children.

### 2.1.2. Health Promoting Programs

Health promotion is very important, as many of the noncommunicable disease can be prevented by health promotion and education [65]. Physical Activity is one of the main component of childhood obesity prevention [66]. In United states, a Comprehensive School Physical Activity Education programs (CSPAP) was published by the Center for Disease Control and Prevention (CDC) which aimed to help school districts in implementing a multicomponent based intervention [67]. Multiple Physical activity intervention programs have been made globally. In one narrative review study that involved 76 promoting interventions for physical activity among children aged between 4-19 years old, showed that most of the interventions were approaching children via the school setting, and to much less extended were involving the family, among these studies the most effective interventions were the ones that involved physical education lessons as well as incorporating curriculum with environmental changes [68]. According to Pate [69], there is limited number of a comprehensive school physical activity model in which a multiple intervention are applied at the same time. The interventional programs can be applied as early as preschool age, in one study involved children aged 4 years old, found that children in the interventional group engaged more Moderate to Vigorous Physical Activity MVPA than children in the control group (7.4 and 6.6 minute/hours, respectively) [70]. In Saudi Arabia, there are multiple promoting campaign which was done by the ministry of health but none of them are followed by any study in order to provide accurate information of the effectiveness of this campaign. In 2011 the ministry of health created the awareness campaign on "Balanced Nutrition and Physical activity" with the intention in spreading the message "Your health is worth the world" but there is no available data regarding the campaign or the exact content of it [71]. There is also the "Obesity control program" which was published in 2013, in order to promote health for all ages in Saudi Arabia through putting an end to obesity and provide high means of protection. Since the program was published there is 1600 health professionals trained on obesity control as well as 40 sites for early detection of obesity and multiple Events was done [72]. Unfortunately, up to this date, there isn't any interventional programs done in order to increase the physical activity among children in Saudi Arabia not even school-based intervention was done. However, the Saudi Arabia Education's ministry announced in July 2017 that Saudi's girls' schools will offer a physical education program starting in the fall of 2017 [73]. The government of Saudi Arabia are aware with the health issues related to obesity as it's rising across the Saudi Arabian population over the past decade. At the same time, we recognize the individual efforts done by each ministry alone. We encourage the development of partnership between different ministries (Health, Education, Sport) in order to develop a comprehensive

program that can lead to an effective change among the Saudi children in a national level. The World Health Organization (WHO) have stated that it is important to implement a population-based, multi-sectorial, multi-disciplinary, and culturally policies as a method to increase physical activity levels globally and enhance the healthy lifestyle behavior among people [74].

### 3. Conclusion

Childhood Obesity is a worldwide problem including Saudi Arabia. The underlying cause for childhood obesity is multifactorial which multiple intervention in order to limit the problem. The current evidence of high prevalence of childhood obesity in Saudi Arabia with no national surveillance data available as well as no clear national level study for risk factors raise the need in giving the childhood obesity prior attention. The fact of no Physical education is available for Girl's school, and no current national or small intervention have been done in order to promote physical active among children is indicating of an unpromising outcome in childhood health. We encourage future researchers to be conducted in larger sample, as well as to start studying the situation in different aspects. As mentioned above, creating multiple programs that can target different risk factor can be very helpful. Starting with developing friendly environmental schools, applying a physical and nutritional education curriculum, encourage the children to be more active during recess and provide before/after school sport and health related program. It is also important to start open multiple Degrees and faculties in Physical Fitness and Education in order to provide a better instructor to sever the public and schools. We also recommend to start providing public sports spaces, reducing the cost of participating in sports, increasing the safety measure in street walking and bicycling. Promote physical activity awareness among families and provide different programs in which parents and children are both involved in physical activity. In order to provide a better health promotion and intervention we recommend developing a partnership between different ministry to provide a comprehensive intervention.

### References

- [1] *Facts and figures on childhood obesity*. 2014 29 october 2014; Available from: <http://www.who.int/end-childhood-obesity/facts/en/>.
- [2] *Global Strategy on Diet, Physical Activity and Health: Childhood overweight and obesity*. Available from: <http://www.who.int/dietphysicalactivity/childhood/en/>.
- [3] Al-Mohaimed, A., et al., *Prevalence and correlates of overweight status among Saudi school children*. Vol. 35. 2015. 275-281.
- [4] Al-Hazzaa, H., *Prevalence and trends in obesity among school boys in Central Saudi Arabia between 1988 and 2005*. Vol. 28. 2007. 1569-74.
- [5] Al-Hazzaa, *Physical activity, fitness and fatness among Saudi children and adolescents Implications for cardiovascular health*. Saudi Medical Journal, 2002. 23(2).
- [6] Grundy, S.M., *Multifactorial causation of obesity: implications for prevention* The American Journal of Clinical Nutrition, 1998. 67(3): p. 563S-572S.
- [7] Ritchie, L.D., et al., *Family Environment and Pediatric Overweight: What Is a Parent to Do?* Journal of the American Dietetic Association, 2005. 105(5): p. 70-79.
- [8] *Healthy active living for children and youth*. Paediatrics & Child Health, 2002. 7(5): p. 339-345.
- [9] Trenell, M.I., et al., *Increased Daily Walking Improves Lipid Oxidation Without Changes in Mitochondrial Function in Type 2 Diabetes*. Diabetes Care, 2008. 31(8): p. 1644.
- [10] Oude Luttikhuis, H., et al., *Interventions for treating obesity in children*. Cochrane Database of Systematic Reviews, 2009(1).
- [11] Strong, W.B., et al., *Evidence Based Physical Activity for School-age Youth*. The Journal of Pediatrics, 2005. 146(6): p. 732-737.
- [12] Pradinuk, M., J.-P. Chanoine, and R.D. Goldman, *Obesity and physical activity in children*. Canadian Family Physician, 2011. 57(7): p. 779-782.
- [13] Al-Hazzaa, H.M., *THE PUBLIC HEALTH BURDEN OF PHYSICAL INACTIVITY IN SAUDI ARABIA*. Journal of Family & Community Medicine, 2004. 11(2): p. 45-51.
- [14] Al-Agha, A.E., F.S. Nizar, and A.M. Nahhas, *The association between body mass index and duration spent on electronic devices in children and adolescents in Western Saudi Arabia*. Saudi medical journal, 2016. 37(4): p. 436-439.
- [15] Al-Hazzaa, H., *Pedometer-determined Physical Activity among Obese and Non-obese 8- to 12-year-old Saudi Schoolboys*. Vol. 26. 2007. 459-65.
- [16] Farahat, F., K. P Joshi, and F. F Al-Mazrou, *Assessment of nutritional status and lifestyle pattern among Saudi Arabian school children*. Vol. 28. 2007. 1298-300.
- [17] Abalkhail, B. and S. Shawky, *Prevalence of daily breakfast intake, iron deficiency anaemia and awareness of being anaemic among Saudi school students*. Int J Food Sci Nutr, 2002. 53.
- [18] De Onis, M., M. Blössner, and E. Borghi, *Global prevalence and trends of overweight and obesity among preschool children*. The American Journal of Clinical Nutrition, 2010.
- [19] Cheryl D. Fryar MDC, a.C.L.O. *Prevalence of Overweight and Obesity Among Children and Adolescents Aged 2-19 Years: United States, 1963-1965 Through 2013-2014*. [[https://www.cdc.gov/nchs/data/hestat/obesity\\_child\\_13\\_14/obesity\\_child\\_13\\_14.htm](https://www.cdc.gov/nchs/data/hestat/obesity_child_13_14/obesity_child_13_14.htm)] 2016 September 19, 2014.
- [20] *Child obesity prevalence: national programme reports its lowest level on record for Reception Year children united kingdom*. 2015; Available from: <http://content.digital.nhs.uk/article/6837/Child-obesity-prevalence-national-programme-reports-its-lowest-level-on-record-for-Reception-Year-children>.
- [21] Musaiger, A., *Overweight and Obesity in Eastern Mediterranean Region: Prevalence and Possible Causes*. Journal of Obesity, 2011. 2011: p. 407237.
- [22] Mouzan, M., *Prevalence of overweight and obesity in Saudi children and adolescents*. Annals Saudi Med, 2010. 30.
- [23] Al-Hazzaa, H.M., et al., *Prevalence of overweight, obesity, and abdominal obesity among urban Saudi adolescents: gender and regional variations*. Journal of health, population, and nutrition, 2014. 32(4): p. 634-645.
- [24] R al-Nuaim, A., E. Bamgboye, and A. al-Herbish, *The pattern of growth and obesity in Saudi Arabian male school children*. Vol. 20. 1996. 1000-5.
- [25] WA, E.-H.M., *comparative study of prevalence of overweight and obesity in children in different provinces of 16. Saudi Arabia*. Journal of Tropical Pediatrics, 2002. 48(3): p. 172-7.
- [26] S.S. Al-Dossary PES, A.H., 2 M. Ezz El Regal3 and A.E. Fouda3, *Obesity in Saudi children: a dangerous reality*. East Mediterr Health J., 2010. 16(9): p. 1003-8.
- [27] O, G., *Nutrition-related health patterns in the Middle East*. Asia Pac J Clin Nutr, 2003. 12(3): p. 337-43.
- [28] Ng, S.W., et al., *The prevalence and trends of overweight, obesity and nutrition-related non-communicable disease in the Arabian Gulf States*. Vol. 12. 2011. 1-13.
- [29] Alkadhri, O., *The management of physiological halitosis: A 20-year systematic review of the literature*. Saudi Journal of Oral Sciences, 2015. 2(1): p. 3-9.
- [30] Lifshitz, F., *Nutrition and Growth*. Journal of Clinical Research in Pediatric Endocrinology, 2009. 1(4): p. 157-163.
- [31] WA, K., *The role of nutrition in maintaining health and preventing disease*. Health values, 1983. 7(2): p. 9-13.
- [32] *2015–2020 Dietary Guidelines for Americans 2015* 2015-; Available from: <https://health.gov/dietaryguidelines/2015/guidelines/>.

- [33] Vos, M.B. and J. Welsh, *Childhood obesity: update on predisposing factors and prevention strategies*. Current gastroenterology reports, 2010. 12(4): p. 280-287.
- [34] Dev, D.A., et al., *Risk factors for overweight/obesity in preschool children: an ecological approach*. Childhood obesity (Print), 2013. 9(5): p. 399-408.
- [35] Marti, A., M.A. Martinez-González, and J.A. Martinez, *Interaction between genes and lifestyle factors on obesity: Nutrition Society Silver Medal Lecture*. Proceedings of the Nutrition Society, 2008. 67(1): p. 1-8.
- [36] Qi, Q., et al., *Sugar-Sweetened Beverages and Genetic Risk of Obesity*. New England Journal of Medicine, 2012. 367(15): p. 1387-1396.
- [37] Sisson, S.B., et al., *Profiles of sedentary behavior in children and adolescents: the US National Health and Nutrition Examination Survey, 2001-2006*. International journal of pediatric obesity : IJPO : an official journal of the International Association for the Study of Obesity, 2009. 4(4): p. 353-359.
- [38] Bell, J.F. and F.J. Zimmerman, *Shortened nighttime sleep duration in early life and subsequent childhood obesity*. Archives of Pediatrics & Adolescent Medicine, 2010. 164(9): p. 840-845.
- [39] Shakira F. Suglia, C.S.D., Earle C. Chambers, and Renée Boynton-Jarrett, *Social and behavioral risk factors for obesity in early childhood*. Dev Behav Pediatr., 2013. 34(8): p. 549-556.
- [40] Janssen, I., et al., *Overweight and obesity in Canadian adolescents and their associations with dietary habits and physical activity patterns*. Journal of Adolescent Health, 2004. 35(5): p. 360-367.
- [41] Janz, K.F., T.L. Burns, and S.M. Levy, *Tracking of Activity and Sedentary Behaviors in Childhood*. American Journal of Preventive Medicine, 2005. 29(3): p. 171-178.
- [42] Amin, T.T., A.I. Al-Sultan, and A. Ali, *Overweight and obesity and their relation to dietary habits and socio-demographic characteristics among male primary school children in Al-Hassa, Kingdom of Saudi Arabia*. European Journal of Nutrition, 2008. 47(6): p. 310.
- [43] Hamam, F., et al., *Effects of Food Habits and Lifestyle on Prevalence of Overweight/Obesity among Schoolchildren in Taif Area, KSA* %J Food and Nutrition Sciences. 2017. Vol.08No.02: p. 16.
- [44] Worobey, J., *Physical activity in infancy: developmental aspects, measurement, and importance*. The American Journal of Clinical Nutrition, 2014. 99(3): p. 729S-733S.
- [45] Caspersen, C.J., K.E. Powell, and G.M. Christenson, *Physical activity, exercise, and physical fitness: definitions and distinctions for health-related research*. Public health reports (Washington, D.C. : 1974), 1985. 100(2): p. 126-131.
- [46] Services, U.D.o.H.a.H. *The 2008 Physical Activity Guidelines for Americans*. 2008; Available from: <https://health.gov/paguidelines/pdf/paguide.pdf>.
- [47] Care, D.o.H.a.S. *UK physical activity guidelines*. 20117; Available from: <https://www.gov.uk/government/publications/uk-physical-activity-guidelines>.
- [48] Kahlmeier, S., et al., *National physical activity recommendations: systematic overview and analysis of the situation in European countries*. BMC Public Health, 2015. 15(1): p. 133.
- [49] Organization, W.H., *Promoting physical activity in the Eastern Mediterranean Region through a life-course approach*. . 2014: Regional Office for the Eastern Mediterranean. .
- [50] health, S.m.o., *Physical Activity.. Facts and Guidelines*, in *Saudi ministry of health 2013*, Ministry of Halth: Saudi Arabia.
- [51] organization, w.h. *Global recommendations on physical activity for health*. 2010; Available from: [http://www.who.int/dietphysicalactivity/factsheet\\_recommendations/en/](http://www.who.int/dietphysicalactivity/factsheet_recommendations/en/).
- [52] Frank, M.L., et al., *The differences in physical activity levels inpreschool children during free play recess and structured play recess*. Journal of Exercise Science & Fitness, 2018. 16(1): p. 37-42.
- [53] *Active Healthy Living: Prevention of Childhood Obesity Through Increased Physical Activity*. Pediatrics, 2006. 117(5): p. 1834.
- [54] McMurray, R.G., et al., *Comparison of Two Approaches to Structured Physical Activity Surveys for Adolescents*. Medicine and science in sports and exercise, 2004. 36(12): p. 2135-2143.
- [55] plan, N.P.A. *The 2018 Report Card on Physical Activity for Children and Youth*. 2018; Available from: <http://physicalactivityplan.org/projects/reportcard.html>.
- [56] Al-Hazzaa, H.M., et al., *Physical activity, sedentary behaviors and dietary habits among Saudi adolescents relative to age, gender and region*. The international journal of behavioral nutrition and physical activity, 2011. 8: p. 140-140.
- [57] N.J. Awadalla, A.E.A., M.A. Hassanein, S.N. Khalil, R. Aftab, Gaballa and A.A. Mahfouz, *Assessment of physical inactivity and perceived barriers to physical activity among health college students, south-western Saudi Arabia*. East Mediterr Health, 2014. 20(10): p. 596-604.
- [58] Omer, A.S.R.A.a.E.O.M., *Physical Activity Behavior Predictors, Reasons and Barriers among Male Adolescents in Riyadh, Saudi Arabia: Evidence for Obesogenic Environment*. international journal of Health Sciences, 2015. 9(4): p. 400-408.
- [59] Aljaaly, E.A., *Physical Activities of Young Girls in Jeddah, Saudi Arabia*. Arab Journal of Nutrition and Exercise (AJNE); AJNE: Vol 1, No 3 (2016)DO - 10.18502/ajne.v1i3.1229, 2017.
- [60] Jago, R., et al., *Parent and Child Screen-Viewing Time and Home Media Environment*. American Journal of Preventive Medicine, 2012. 43(2): p. 150-158.
- [61] Barkin, S.L., et al., *Parent's Physical Activity Associated With Preschooler Activity in Underserved Populations*. American journal of preventive medicine, 2017. 52(4): p. 424-432.
- [62] Health Analysis Division, S.C., Ottawa, Ontario., *Prent-Child association in physical activity and sedentary behaviour*. Health Rep, 2017. 28(6): p. 3-11.
- [63] Pratt, K.J., J. Cotto, and J. Goodway, *ENGAGING THE FAMILY TO PROMOTE CHILD PHYSICAL ACTIVITY*. ACSM's Health & Fitness Journal, 2017. 21(5).
- [64] Amer, M., G.A. Arfaj, and A.A. Alodhayani, *Children's Physical Activity Awareness among Mothers in a Saudi Arabian Health Center*. Journal of Clinical and Diagnostic Research : JCDR, 2017. 11(3): p. OC51-OC56.
- [65] Kumar, S. and G. Preetha, *Health promotion: an effective tool for global health*. Indian journal of community medicine : official publication of Indian Association of Preventive & Social Medicine, 2012. 37(1): p. 5-12.
- [66] *Prevention of Pediatric Overweight and Obesity*. Pediatrics, 2003. 112(2): p. 424.
- [67] Prevention., C.f.D.C.a. *Comprehensive School Physical Activity Program (CSPAP)*. Available from: <https://www.cdc.gov/healthyschools/physicalactivity/cspap.htm>.
- [68] Peykari, N., et al., *Promoting Physical Activity Participation among Adolescents: The Barriers and the Suggestions*. International journal of preventive medicine, 2015. 6: p. 12-12.
- [69] Pate, R.R., J.I. Flynn, and M. Dowda, *Policies for promotion of physical activity and prevention of obesity in adolescence*. Journal of Exercise Science & Fitness, 2016. 14(2): p. 47-53.
- [70] Pate, R.R., et al., *An Intervention to Increase Physical Activity in Children: A Randomized Controlled Trial With 4-Year-Olds in Preschools*. American Journal of Preventive Medicine, 2016. 51(1): p. 12-22.
- [71] health, S.m.o. *Awareness Campaign On Balanced Nutrition and Physical Activity*. 2011; Available from: <https://www.moh.gov.sa/en/Ministry/MediaCenter/Ads/Pages/Ads-2011-5-21-001.aspx>.
- [72] Al-Omari, D.S.b.A. *Obesity Control Program*. 2013; Available from: <https://www.moh.gov.sa/en/OCP/Pages/DirectorMessage.aspx>.
- [73] Education, M.o. *The ministry of Education approves the application of physical education program in girls' schools*. 2017; Available from: <https://www.moe.gov.sa/ar/news/Pages/edu-sport.aspx>.
- [74] *Physical Inactivity: A Global Public Health Problem*. Available from: [http://www.who.int/dietphysicalactivity/factsheet\\_inactivity/en/](http://www.who.int/dietphysicalactivity/factsheet_inactivity/en/).

