Vol. 5 No. 2 (2026)

Pakistan Journal of Medical & Cardiological Review

https://pakjmcr.com/index.php/1/about

Online ISSN 3007-2387

Print ISSN 3007-2379

Prevalence and Risk Factors of Childhood Obesity under the age of 12 years in District Faisalabad

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Keywords: Childhood Obesity, Anthropometric Measurements, Body Mass Index (BMI), CDC Center for Disease Control and Prevention

Received on 12 May 2026
Accepted on 11 June 2026
Published on 19 June 2026

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Abstract

Obesity in children is a complicated metabolic disorder that poses serious health hazards due to excessive body fat accumulation. A rising public health problem is the rising incidence of childhood obesity, which is frequently associated with a number of behavioral, environmental, and genetic risk factors. The purpose of this study is to ascertain the prevalence of children obesity in Faisalabad and to pinpoint risk variables that are linked to it, such as socioeconomic status, parental influence, physical activity levels, and eating habits. Children ages 0–12 will be enrolled from nearby schools and community centers using a cross-sectional strategy. Anthropometric measurements (height, weight, and BMI), meal recalls, and questionnaires about family dynamics and physical activity will all be used to evaluate the participants. Underweight, normal weight, overweight, and obese are the weight categories into which children will be divided.using growth charts from the CDC. In order to investigate their influence on children's weight status, parental information will also be gathered, including height, weight, occupation, and educational attainment. In addition, the study will assess family structure, sleep length, and screen time as possible risk factors. The results of this study will help shape public health campaigns and intervention tactics targeted at lowering childhood obesity rates in Faisalabad by offering important insights into the prevalence of childhood obesity and its risk factors.

Introduction
CHAPTER 1

Childhood obesity has become the biggest health concerns due to its sharp increase in worldwide prevalence. The occurrence of obesity in childhood escalated to concerning levels globally, WHO estimates that there are 340 million young people between the ages of 5 and 19, suffering from this condition in 2016 and about in 2020, 38 million kids younger than five will be considered obese (Hudaib, M, etal.,2024). Childhood obesity is becoming more prevalent and poses a significant public health concern. During the recent years, the percentage of kids in developing nations is increasing day by day. (Jia, etal.,2021). In every nation, the prevalence of obesity is rising,with about two hundred and twenty million people, 54% of Pakistan's population is below the age of 19 making it a developing country.

According to the 2021 global hunger index, the nation has a severe hunger problem and is rated 92nd out of 116 countries. Pakistan is the ninth most obese country in the world, with half of its people being overweight or obese. The World Obesity Federation estimates that more than five million school going kids in Pakistan would be overweight by 2030. Pakistan is therefore struggling with both too little and too much nourishment. To combat obesity, Pakistan has not yet implemented a successful approach, according to the WHO Diabetes country profiles (Tanveer, etal.,2022).

According to studies, Overweight or obesity in children may be caused by a variety of circumstances. Obesity among preschoolers is on the rise, this poses a significant risk to health of people (Kurspahić-Mujčić, etal.,2020). Obesity is a complex, multifaceted disease even if ancestry may play a big part in the development of obesity, the enormous and quick increase in obesity in the wider population cannot be explained by genes alone. This obesity epidemic is thought to be caused by gene–environment interactions which are exacerbated by a more lenient obesogenic environment with varying degrees of determinants (Pereira, A. R., & Oliveira, A. 2021).

Large consumption of harmful foods, physical exercise, sedentary behavior, among the risk variables which combine to promote overweight or obesity include insomnia, too much screen time, excessive levels of mental tension, and family history. The incidence and impact of several risk variables for the onset and maintenance of pediatric obesity are significantly influenced by socioeconomic status (Vazquez, C. E., & Cubbin, C. 2020).

Since nutrition is a modifiable risk factor and dietary intake typically follows a pattern of consumption, knowledge of dietary patterns can help one comprehend the relationships between diet quality and its impact on health, particularly with regard to obesity. Because, it considers the intricate relationships between nutrients and other dietary components, the study of dietary patterns has been found to provide a more realistic depiction of dietary habits, enabling interventions to alter eating habits (Liberali, etal.,2020).

Research indicates that the higher prevalence of obesity among kids may be significantly influenced by a reduced physical activity (Wyszyńska, etal.,2020). A healthy weight and general well-being depend on physical activity, yet many kids don't get the necessary amounts of exercise. There are significant considerations for both individual health and society as a whole from the growing gap between lifestyle choices and health outcomes, making it essential to promote active living among the younger generation.

Overweight parents before becoming pregnant are highly predictive of higher birth weights as well as childhood obesity and overweight (Hieronimus, B., & Ensenauer, R. 2021).

It is crucial to treat weight concerns before and during conception in order to improve prolonged illness consequences, as both moms and paternal obesity form a

complex risk environment that can predispose children to obesity.
A different approach is used by other systems, such as the WHO and the UK, which classify obesity at the 98th percentile, depending on how many standard deviations the body mass index of kids is abnormal. By monitoring body mass index percentiles from ages 2 to 18, the International Obesity Task Force's third, more stringent approach correlates childhood BMI to the adult cutoffs of 25 and 30 (Lakshman R, etal.,2012).
Diseases related with Childhood Obesity:
In children, Obesity causes the multiple diseases such as cardiovascular illnesses, the leading causes of illness and death are cardiovascular diseases, high blood pressure, heart failure, fatal strokes, cancer, arthritic conditions diabetes of the type 2 kind, and chronic renal and liver illnesses.
Compared to adults, obesity-related mortality is uncommon. Therefore, it is essential to conduct public policy initiatives to change how childhood obesity develops (Deal, et al.,2020).
Since the bar is raised to about the 99th percentile, fewer kids are considered fat, but those who are may be more vulnerable to major health problems. The ideal way to determine whether children actually require medical care is still up for dispute.

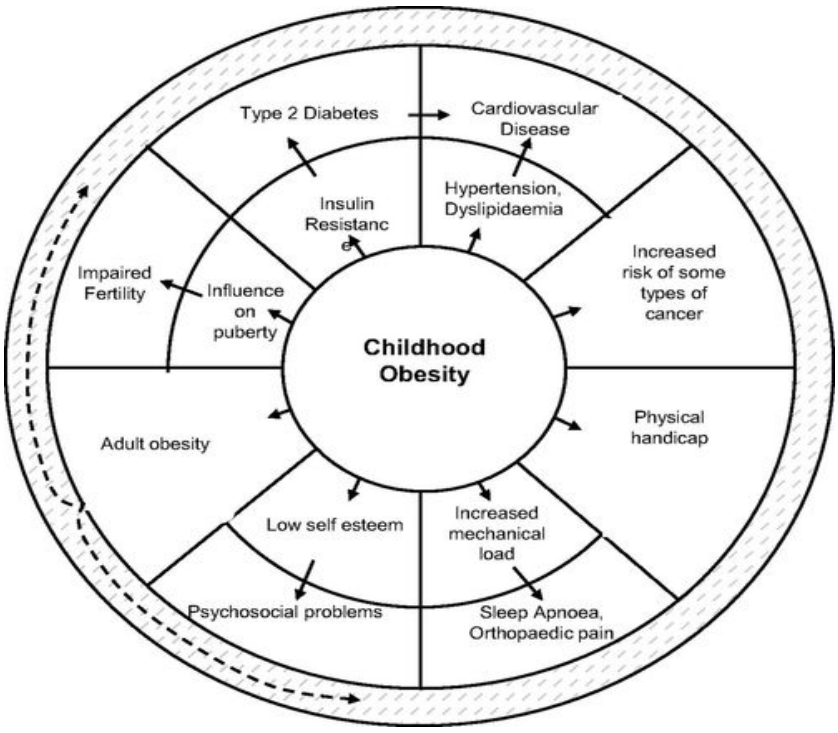

Figure 1. 1Two-layer model to show how childhood obesity affects long-term health

FIG showing A two-layer model is used to show how childhood obesity affects long-term health. The underlying mechanisms that cause disease, such as hormonal and metabolic alterations, are symbolized by the inner ring. Comorbidities, or linked medical illnesses, such diabetes, high blood pressure, and liver issues, are displayed in the outer ring. Children who are obese are also more likely to become obese adults, which raises their risk of developing a number of health issues.
Childhood obesity is a serious global health issue since it increases the risk of chronic conditions like cardiovascular disease and type 2 diabetes in later life. Overweight children are much more likely to grow up to be obese adults, which may have long-term detrimental impacts on their financial and health well-being (Freedman, D.S.,

L.K. Khan, M.K. Serdula, et al. 2005).

Medical expenses and missed productivity might total more than $250 billion in the United States. (Simmonds, etal., 2016). Early onset of obesity and associated conditions can have a significant negative influence on people during their prime working years, placing a significant burden on the economy and public health (Ward, Z.J, et al., 2017).

Children with more extreme obesity are far more likely to develop type 2 diabetes than children who are only mildly obese. Actually, the most important clinical indicator for this illness in kids and teenagers is extreme obesity. According to studies, children with type 2 diabetes usually have a (BMI) 35 to 39. The fact that roughly one in five of these children have a BMI above 45 and approximately one in three have a BMI over 40—levels that indicate extreme obesity and a significant health risk—is even more worrisome (Bendor CD, etal.,2020).

Although the number of obese adolescents is still rising, some new research indicates that obesity rates among younger children may be beginning to level off or possibly modestly fall. (Christian Flemming GM, etal.,2019) According to a study conducted in Germany, up to 6.3 perecent are obese and fifteen percent of kids aged three to seventeen are overweight(KurthBM,etal.,2007).

Given its strong correlation with other metabolic issues including hypertension, high insulin, and elevated cholesterol is a major health risk. When these problems come together, they create a condition called metabolic syndrome, which significantly increases cardiovascular disease risk. Indeed, it can double the heart disease risk and premature death in both adults and children (Urbina EM, etal.,2010).

Obesity has significant associations with both asthma and hypertension, two severe health conditions that frequently impact kids and teenagers. (Lang, et al., 2018). Although obesity has not been a contributing factor in the rise in asthma incidence, compared to their mates with an average size, overweight kids have a higher likelihood of having asthma and exhibiting specific symptoms, such as worse breathing problems and increased dyspnea (Lang, et al., 2015). High blood pressure, or hypertension, is also on the rise in young people and it is closely related with elevated BMI. (May AL, etal.,2012.) Studies indicate that contrary to only three percent of kids in the general public, a quarter of obese youngsters may have high blood pressure. Compared to children of average weight, obese Kids have a significantly higher risk of developing hypertension (Shatat IF, Brady TM. 2018).

Children who are obese are particularly susceptible to obstructive sleep apnea (OSA), breathing periodically stops or becomes shallow as they sleep as a result of constricted airways. Actually, OSA or other sleep-related respiratory issues may affect as much as 60% of obese children and teenagers (Narang I, Mathew JL. 2012). This disorder affects more than simply sleep; it can cause major problems such persistent daytime fatigue, cognitive and learning difficulties, decreased physical activity, hypertension, and heart strain. A child's quality of life may be greatly impacted by each of these issues. One of the most important aspects of treating OSA is controlling weight with regular exercise and a nutritious diet, while surgery may also be required in certain situations (Blechner M, Williamson AA. 2016).

Children who are overweight have a higher chance of becoming obese adults, thus early detection and treatment may help lower future health risks and lessen the overall cost of healthcare. Mostly, indicator used for obesity is body mass index (BMI), however it has drawbacks because it calculates extra weight for height rather than actual body fat or fat distribution, which are more pertinent to health hazards. More precise information might be provided by other straightforward measurements such as the waistline-to-height ratio, skin-fold thickness, and waist measurement. Measured with calipers at particular body locations, such as the triceps, belly, or thigh, skinfold thickness (ST) is a measurement of subcutaneous fat, or fat directly beneath the skin. It is employed to calculate the proportion of total body fat.

The distance around the narrowest portion of the waist, which is often immediately above the belly button, is known as the waist circumference (WC). It aids in the evaluation of abdominal fat, which is strongly associated with health hazards such as diabetes and heart diseases.The distance around the hips and buttocks' broadest point is measured by the Hip Circumference (HC). It aids in determining the one useful indicator of fat distribution is the waist-to-hip ratio and associated health hazards, when combined with waist circumference (Simmonds, etal.,2016).

Prevalence:

In recent years, around 340 million people aged 5 to 19 are categorized as overweight, according to WHO data. The situation is especially concerning in Pakistan, where a study conducted in Punjab in 2022 found that overweight was present in 66.9% of kids in preschool with 5.8% classified as obese. In addition to endangering the health of future adults by raising the chances of prolonged illnesses like cardiovascular diseases and diabetes, this expanding epidemic also heavily strains healthcare infrastructures, particularly in developing nations. Mothers are a major influence on children's eating patterns, levels of exercise, and perspectives on physical appearance and health, among other contributing factors.

Their attitudes and actions can significantly affect a child's risk of becoming obese. Despite this, there hasn't been much research done in Pakistan on how mothers affect childhood obesity. By investigating mothers' knowledge, attitudes, and behaviors regarding childhood obesity, this study seeks to close that knowledge gap and offer important insights into one of the major socioeconomic factors of this urgent health concern (Hudaib M, etal.,. 2024).

There is still an absence of literature specifically about Pakistan, despite regional and worldwide evidence suggesting an expanding epidemic, especially in clinical settings like the Children's Hospital in Faisalabad. Although there is a lack of comprehensive documentation, informal observations and pediatric consultations point to a growing trend. Developing successful local health policies and preventive measures requires an understanding of the prevalence and risk factors in these environments (Tanveer, et al.,2022).

Risk factors

The frequency of overweight, underweight, and obesity among students in school kids and teens in Pakistan is currently linked to demographic characteristics. Studies suggest that young obesity or overweight may be caused by a variety of causes. Children are becoming more obese, which is a major public health problem(Kurspahić-Mujčić, A., & Mujčić, A.2020). Obesity is a complex, multifaceted disease. The enormous and quick increase in adiposity in the entire population cannot be explained by genes alone, even if genes may play a major influence in the course of obesity.This obesity epidemic is thought to be caused by gene–environment interactions which are exacerbated by a more lenient obesogenic environment with varying degrees of determinants (Pereira, A. R., & Oliveira, A. 2021).

Among the risk variables which combine to promote overweight or obesity include Large consumption of harmful foods, physical exercise, sedentary behavior, poor sleep habits, excessive television time, an elevated level in psychological stress, and a family medical history. The incidence and impact of several risk variables for the onset and maintenance of pediatric obesity are significantly influenced by socioeconomic status (Vazquez, C. E., & Cubbin, C. 2020).

The increasing prevalence of childhood obesity may be mostly attributed to children's simultaneous consumption of more sugar-filled snacks, beverages, and fast food (Trier C,etal.,2016). Since nutrition is a modifiable risk factor and dietary intake typically follows a pattern of consumption, knowledge of dietary patterns can help one comprehend the relationships between diet quality and its impact on health, particularly with regard to obesity. Because, it considers the intricate relationships

between nutrients and other dietary components, the study of dietary patterns has been found to provide a more realistic depiction of dietary habits, enabling interventions to alter eating habits (Liberali, etal., 2020).

Dietary practices are important in both causing and treating childhood obesity. According to research, children with abnormalities in their fat metabolism can greatly benefit from a low energy diet that includes components of a low glycemic index. Dietary changes, such as choosing foods with a lower glycemic index and increasing meal frequency, did not, however, generally result in appreciable improvements in BMI in younger children, ages 3 to 6. Low adherence contributed to this limited impact, as many kids continued to eat only three meals a day without making significant dietary modifications.

On the other hand, after the same nutritional intervention, school-aged children (7–15 years) with simple obesity showed considerable improvements, including significant reductions in body mass, skinfold thickness, arm circumference, and body fat percentage. Changes in reductions in sweets consumption and daily caloric intake, fats, and high-carbohydrate diets were closely monitor (Weker H. Badania nad powiazaniem czynnika zywieniowego z otyłościa prosta u dzieci .,2006).

Sedentary habits, particularly screen time, and physical activity (PA) have a significant impact on kids' weight. By setting an example and influencing the atmosphere at home, parents can possess a vital role in preventing obesity and overweight by promoting active lifestyles at a young age. Using a social-ecological framework that encompasses five domains—demographic, psychological, behavioral, social and cultural, and physical environment—systematic reviews have investigated the factors that influence PA and sedentary behavior in early children. Nevertheless, despite their significance, these reviews have not fully examined elements like parental self-efficacy, general parenting style, and parental role modeling in the social and cultural space (Xu H, Wen LM, Rissel C.,2015).

Children's physical activity (PA), which tends to decrease with age, is a major area of concern for promoting cardiovascular health and preventing obesity. Through particular parenting practices—context-based tactics meant to affect children's habits—parents have a big say in how their kids behave. Research has indicated that better behaviors in children are linked to parenting approaches that address food, physical activity, and screen time. For example, limiting TV viewing is linked to less screen time, whereas offering logistical support for PA is linked to higher levels of child activity. Definitions and assessment instruments for parenting practices related to PA, however, differ, with some placing a strong emphasis on screen-media limitations. Through a displacement effect, screen time affects kids' levels of activity, with higher PA being associated with less sedentary behavior
(O'Connor TM, etal., 2013).

Numerous research have shown a connection between youth body composition and eating habits. Low-energy, low-glycemic index diet interventions have improved body fat measurements and lipid profiles, especially in school-aged obese children. Younger children, however, showed only modest impacts, frequently as a result of noncompliance with dietary modifications. Improvements in BMI were substantially correlated with a reduction in the intake of sweets and high-energy meals, underscoring the part that particular eating habits play in the development of obesity. The notion that early eating habits and food choices may have an impact on long-term weight status and metabolic health is supported by these data (Dalrymple KV, etal.,2020).

Poorer childhood health and a higher chance of obesity and overweight are strongly linked to lower socioeconomic level (SES). Disparities in adult health are also a result of these early-life circumstances. The association between SES and weight is influenced by various factors, notably those within the family environment—such as media availability, parenting methods, sibling conduct, and family routines. These

variables, which are influenced by parental wealth and education, have an effect on children's habbits of sitting down andpassive lifestyle, which in turn affects their weight and general health. Children's health behaviors may improve if these variables are recognized and changed (Tandon PS, Zhou C, etal., 2012).

The formative years are essential for the growth of healthy lifestyle practices, such as exercising and nap —collectively known as motion behaviors. These behaviors, which range from low-intensity activities like sleeping to high-intensity physical activity, have been repeatedly connected to obesity outcomes in children and young people in school. Even though it is becoming more widely acknowledged that habits acquired during this era can have long-lasting health repercussions, less is known about how these movement behaviors affect adiposity in younger children, ages 0 to 5. The development of movement behaviors—a group of healthy living habits that include sleep, sedentary behavior, and physical activity—depends heavily on the early years. These behaviors, which vary from high-intensity physical exercise to low-intensity activities like sleeping, have been linked again and time again to obesity outcomes in children and adolescents at school. Less is known about how these movement behaviors impact obesity in younger children, ages 0 to 5, despite the growing recognition that habits formed during this era can have long-lasting adverse health impacts (Kuzik N, Carson V., 2016).

This is troubling because most preschoolers do not meet recommended exercising and sitting lifestyle criteria, and more than 42 million kids younger than 5 suffer from obesity globally. Furthermore, young children's sleep duration has been decreasing with time. Understanding how movement behaviors interact in this age group is crucial since early childhood is a crucial time for forming healthy habits and early patterns in behavior and weight tend to last into later life (Carson V, etal., 2017).

Research indicates that a lower level of moving may possess a vital role in elevated incidence of kids overweight (Wyszyńska, et al.,2020). Healthy weightof general well-being depend on physical activity, yet many kids don't get the necessary amounts of exercise.

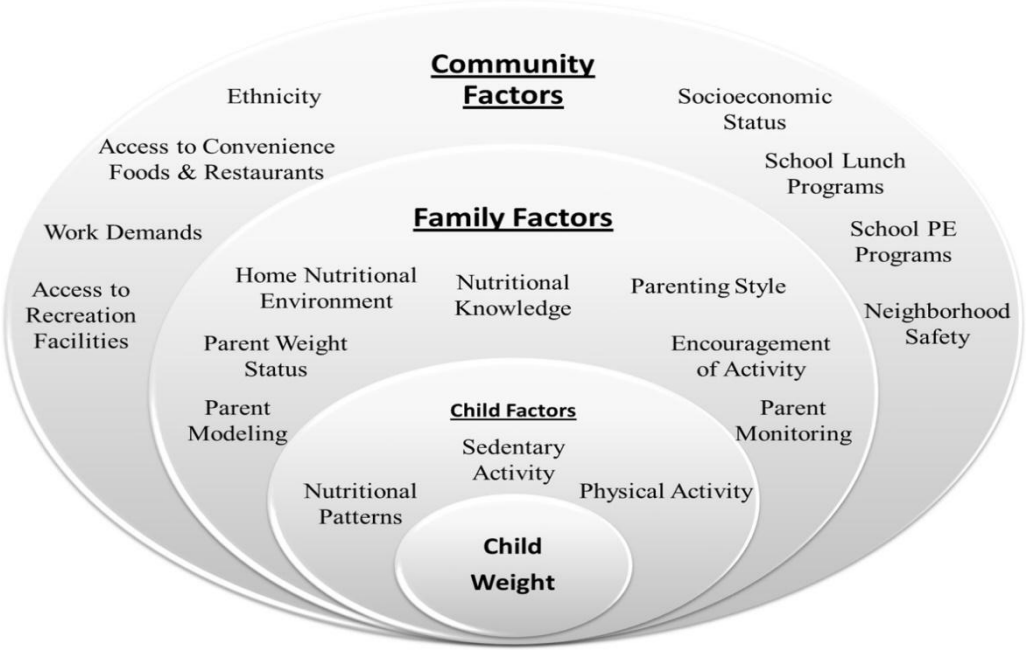

Figure 1. 2 An ecological model of obesity in children

Children who don't get enough sleep appear to be more likely to grow up to be overweight, despite the fact that data on sleep isn't as extensive as that on other issues. According to certain research, this association may persist until maturity after first

appearing in early childhood. (Appelhans BM, Fitzpatrick SL, Li H, et al.) Children are far less likely to suffer from obesity, particularly in the preschool years, when they receive enough sleep, especially when combined with good family practices like sharing meals and limiting screen time (Bell JF, Zimmerman FJ .,2010).

It is increasingly acknowledged that stress plays a significant role in childhood obesity. Children can be impacted by a variety of stressors, including stress from their parents or the home environment, as well as stress from their own personal lives (Wilson SM, Sato AF.,2014).

A child's endanger of being obese may be increased by any of these factors, either separately or in combination. Continuous stress appears to be linked with an elevated level of overweight, beginning in kids and maybe continuing into adulthood, however the study is still in its early infancy.(Evans GW, etal., 2012). Research also indicates that kids are likely to suffer from obesity if their parents are under stress, particularly if that stress comes from a variety of sources. In general, family stress has a comparable impact (Fuemmeler BF, Dedert E, McClernon FJ, et al., 2009).

Kids obesity has grown could be a serious issue for public health in recent decades, and the long-term health effects are becoming more and more obvious. Early childhood is a crucial time for prevention initiatives centered on healthy lifestyle choices since studies indicate that changes in body size between the ages of two and six are closely associated with adult obesity (Reilly JJ, Kelly J.,2011).Although additional research is required to completely grasp their effects, it is believed that preschoolers' increased screen time (ST) and substantial decrease in outdoor play (PO) are contributing factors to this trend. Compared to earlier generations, children today spend less time being physically active, particularly between the ages of three and twelve(De Kroon ML,etal.,2010). This decrease is alarming as along with a nutritious diet, leading a physically demanding existence can increase your daily consumption of energy and would be a useful strategy for combating obesity. Preschool-aged children who play outside more frequently had a lower body mass index , with reference to some research, however these results are frequently restricted to cross-sectional or short-term studies (Bassett DR, etal.,2014). Despite advice from groups like the American Academy of Pediatrics, which advises restricting high-quality media use to no more than one hour per day for children over two, young children's screen use is rising and starting younger (Ansari A,etal.,2015).

Again, a large portion of the evidence supporting the link between excessive television time and overweight and delayed development comes from studies that do not follow children over time. Our objective is to investigate whether screen usage or outdoor play between the ages of three and six is related to body measurements at the age of six in light of this gap in long-term studies (Certain LK, Kahn RS.2011).

More and more research indicates that sedentary behavior, particularly screen-based hobbies, frequently begins early in infancy. In spite of this, a lot of parents think their young kids don't use screens excessively. (Hinkley T,etal.,2014)However, there is mounting evidence that excessive screen time (ST) has a number of detrimental effects, such as behavioral and emotional problems in kids and more general health issues in adults. One major worry is how it affects sleep, which is crucial for kids overall development and healthy lifestyle. Research has shown that activities like watching TV or using computers might cause children to sleep for shorter periods of time (Wu X,etal.,2017).

There are significant considerations for both individual health and society as a whole from the growing gap between lifestyle choices and health outcomes, making it essential to promote active living among the younger generation.Overweight parents before becoming pregnant are highly predictive of higher birth weights as well as childhood obesity and overweight (Hieronimus, B., & Ensenauer, R. 2021).

It is crucial to treat weight concerns before and during conception in order to improve lasting medical health results, as both maternal and paternal obesity form a complex

risk environment that can predispose children to obesity. This study's goal is to determine how common pediatric obesity is at the pediatric hospital in Faisalabad and to pinpoint important risk variables, such as parental influence, food, physical inactivity, and socioeconomic position. The results are meant to bolster evidence-based treatments and community-specific awareness initiatives.

Statement of Problem:

The goal of the current study is to address the growing issue of childhood obesity in the Faisalabad area among children under the age of ten. Even with greater awareness, there is still a dearth of thorough information on the prevalence, lifestyle choices, and risk factors that contribute to pediatric obesity. In order to shed light on the early signs of obesity and aid in the creation of successful preventive measures and public health initiatives, this study aims to investigate these variables in both clinical and academic environments.

Hypothesis:

"In children aged 6-12 years, the prevalence of obesity is positively correlated with excessive screen time, insufficient physical activity, higher body mass index (BMI), increased consumption of junk food and obesity status of both parents "

Reseach Objectives:

To assess the prevalence of childhood obesity among children aged under 12 years in Faisalabad District.

To identify and analyze the key risk factors contributing to childhood obesity, including excessive screen time, lack of physical activity, high body mass index (BMI), and junk food consumption.

To investigate the relationship between maternal and paternal obesity and the prevalence of obesity in their children, assessing how parental weight status influences children's health behaviors.

CHAPTER 2
LITERATURE REVIEW

According to studies, the total rate of childhood obesity in Brazil increased from 8.2% between 1986 and 2015 to 12% in more recent years. There are notable gender disparities, with boys having greater obesity rates (9.7%) than girls (7.3%). Developed regions such as the South and Southeast exhibit higher prevalence, according to regional inequalities. Socioeconomic status, eating patterns, physical inactivity, and environmental factors are important risk factors. Because of their intricate interactions, these factors need for focused interventions. All things considered, combating childhood obesity necessitates a multidimensional strategy taking into account these various factors. Ferreira, C. M., Reis, N. D. D., Castro, A. D. O., Höfelmann, D. A., Kodaira, K., Silva, M. T., & Galvao, T. F. (2021).

Significant trends in overweight kids are shown by the Childhood Obesity Surveillance Initiative (COSI), which shows that prevalence is declining in Southern European nations while being stable or rising in Northern and Eastern European nations. For example, Portugal had a notable decrease in overweight (from 40.5% to 28.4%), whereas Lithuania reported rises in obesity (from 9.4% to 12.2%) and overweight (from 24.8% to 28.5%). Regional variations in physical activity levels, food patterns, and socioeconomic status are common risk factors. The relevance of implementing policies is highlighted by successful interventions in a number of nations, bust the continuation of high rates highlights the necessity of ongoing efforts. For preventative measures to be effective in a variety of European situations, several variables must be addressed. Buoncristiano, M., Spinelli, A., Williams, J., Nardone, P., Rito, A. I., García-Solano, M., & Breda, J. (2021). Childhood overweight and obesity in Europe: Changes from 2007 to 2017.

According to a comprehensive review, an estimated 19% of Ghanaian children suffer

from kids obesity, making it a serious public health issue. In particular, the occurence of kids was 10.7% and obesity was 8.6%, with somewhat higher rates among females than males. Significant differences between rural (17.4%) and urban (8.9%) environments are noteworthy, underscoring the impact of environmental factors on obesity incidence. Dietary practices, physical inactivity, and socioeconomic impacts are important risk variables that need more research. These trends demonstrate the pressing need for wellness measures to fight childhood obesity in Ghana and encourage healthier living. Future generations' health is at risk due to the consequences of this increasing prevalence, which highlights the significance of taking preventative action (Akowuah, P. K., & Kobia-Acquah, E.,2020).

(Apperley, et al.,2022) reviewed that globally, childhood obesity is becoming more common, and its increasing severity poses serious public health issues. Affected youngsters are increasingly experiencing complications such fatty liver disease, dyslipidemia, hypertension, and psychological problems. Poor eating habits, inactivity, and environmental variables are important risk factors. Pharmacotherapy and surgery are reserved for instances who are resistant, and lifestyle changes are given priority in current treatment guidelines. Although studies on childhood obesity are not as advanced as those on adults, new treatments are being investigated to increase the range of available treatments. This expanding knowledge emphasizes how urgently effective interventions are needed to combat and control childhood obesity.

According to National Institute of Child Health research, 57.1% of kids were obese, with younger age groups and boys having a greater incidence. Children below the nine were also more likely to be overweight adjusted (OR: 3.40)., and male kids were more likely to be obese (adjusted OR: 3.95), Excessive screen time and inadequate levels of physical activity are major factors driving obesity rates. With adjusted Odd Ratios of 0.31 and 0.24, respectively, the study showed that children who participated in little physical activity at school and who spent less than four hours in front of a computer were much less likely to be overweight or obese. Bekhwani, A. R., & Khan, M. (2022).

According to a recent descriptive cross-sectional study, obesity are significantly more in Dhaka among school-going children aged 9-14, especially among males (67.1%). With reference to survey, the occurence of adiposity was sparticularly high in males attending private schools (38.8% overweight, 32.7% obese) and girls attending public schools (35.7% overweight, 17.9% obese).Lack of involvement in sports was one of the main behavioral variables causing this trend; more than 80% of obese kids did not involve in exercising at school or outside. Sedentary behavior was also common, with 97.5% of participants participating, and there was a notable predilection for fast food (60.8%). The kids didn't eat enough fruits and vegetables, which was another issue with their eating habits. Hossain, M. T., Luies, S. K., & Biswas, T. (2020).

(Hadier, et al.,2023). This study fills a significant research gap by examining the link between BMI and socioeconomic level (SES) in Multan kids, Pakistan, who are between the ages of 8 and 12. As part of the PAK-IPPL project, a sample of 455 children was chosen by stratified random sampling for this cross-sectional poll was conducted all year long.The results show that SES has a considerable impact on BMI and body weight, with greater SES being linked to higher values. Children from higher SES households had an average weight of 35.31 kg and body mass index of 18.06 kg/m^2, indicating a disturbing trend where economic disparities lead to obesity. According to this study, Boys had larger waist circumferences than girls, but there were no discernible gender differences in height, age, or BMI.

To ascertain the proportion as well as its sociodemographic correlations, another cross-sectional study examines data from 132,231 pairings of mothers and children

in Bangladesh, India,Maldives, Nepal and Pakistan. With the highest rates recorded in Maldives (1.5% obese and 3.9%overweight) and the minimized in Nepal country (1.2% overweight and 0.2% obese), the results show an whole occurence of 1.91% adiposity and 0.89% obesity in kids under five.

In view of the twin cost of malnutrition, these rates—while still low when compared to those in high-income nations—highlight a growing problem. Important sociodemographic variables that are strongly linked to childhood obesity and overweight include household wealth status, maternal education and body mass index (BMI), and dietary diversity. Children who ate a varied diet were 27% percent are more probable to be fat or overweight.Effect of maternal health on child nutrition outcomes was further highlighted by the fact the chance was significantly higher for kids whose parents were normal BMI (Relative Risk (RR)= 1.81), overweight (RR = 1.99), or obese (RR = 1.88). Indicating the influence of socioeconomic position on eating habits and lifestyle choices, higher wealth quintiles were also linked to increased prevalences of adiposity Bishwajit, G., & Yaya, S. (2020).

Nearly one in five children may develop obesity by the age of six, according to research, and a large portion of this risk begins before birth. Unexpected research indicates that children of mothers with gestational diabetes may actually have a lower risk of becoming obese, perhaps as a result of improved prenatal care. However, a mother's weight gain during pregnancy, particularly significant increase in weight throughout the 2nd and 3rd trimesters, can increase a child's risk of becoming obese. Whether the child was breastfed, the weight of the parents, the family's eating habits, a reduction of exercise and restricted availability of wholesome food or play areas are additional significant risk factors. Early intervention—ideally during pregnancy—and attention to the child's surroundings and health-related habits are key to preventing childhood obesity (Sneed, N.M., Heerman, W.J., Shaw, P.A. et al. 2024).

The relationship between snoring in two-year-olds and growth and early indicators of cardiovascular or metabolic risk was investigated in a study from the Finnish CHILD-SLEEP birth cohort. The study discovered that increased snoring during sleep was linked to decreased amounts of "good" cholesterol (HDL) and a crucial protein, ApoA1, which helps protect the heart, even though development patterns in children who snored and those who didn't differed significantly. Simultaneously, snoring was linked to increased hs-CRP levels, an inflammatory marker that may indicate future cardiac issues. According to these results, frequent snoring in very young children may indicate mild metabolic abnormalities that could raise the chance of developing cardiovascular illness later in life (Katila, M., Satomaa, AL., Himanen, SL. et al.2024).

According to a recent study conducted in the Shimla district, more than 60% of preschoolers between the ages of three and five had ECC, and the likelihood increased with age. It's interesting to note that kids from wealthier families were more likely to develop cavities, which goes against popular belief. The study also found a strong correlation between higher decay rates and lower salivary pH, which denotes a more acidic oral environment. Age, salivary acidity, and socioeconomic position were the most important determinants, however body weight, food, feeding practices, and dental cleanliness also had an impact. To lessen the growing responsibility of ECC in young children, these findings emphasize the critical need for improved oral health education, early intervention, and easily accessible dental care (Thakur, S., Sharma, R., Singhal, P. et al.2025).

Children from lower-income homes or moms with less education had a much higher chance of being obese by the time they were 8 to 11 years old, according to a big multinational study that used data from over 26,000 children in six high-income nations. This pattern was consistent in almost every country that was examined, demonstrating a distinct socioeconomic gradient: the risk increases with decreasing SES. It's interesting to note that Sweden had significantly lower SES disparities in

obesity rates, which researchers think could be because of progressive laws like free school lunches, substantial parental leave, and stringent advertising regulations meant to protect kids. These results highlight the significant impact that social and economic factors can have on children's health and imply that astute public policies can aid in minimizing these disparities (White, P.A., Awad, Y.A., Gauvin, L. et al,.2022).

Although studies on animals and adults have connected the hormone asprosin, which assists in the production of sugar and the control of hunger,to obesity, its function in children is still unknown. In order to investigate this relationship in kids, a fresh meta-analysis and systematic examination compiled data from six observational studies. It's interesting to note that there was no compelling evidence linking childhood obesity to elevated levels of circulating asprosin. They did, however, find a slight but significant correlation between asprosin and total cholesterol levels, suggesting that Asprosin may contribute to the body's fat metabolism rather than being a root cause of obesity (Zhang, Y., Zhang, Y., Yang, B. et al.,2024).

A recent Swedish study looked at the link between these weight at birth outcomes, maternal factors, including age, weight, lifestyle, and socioeconomic level. The findings indicated that while being a first-time mother or giving birth before the due date increased the chance for SGA, maternal overweight and obesity greatly enhanced the likelihood of having an LGA infant. Interestingly, in this case, characteristics that are frequently identified in previous studies like income or unhealthy lifestyle choices—were not statistically significant, which may be a reflection of Sweden's robust social support and healthcare systems. These findings demonstrate the growing impact of maternal obesity on the health of babies and the urgent need for public health efforts that promote healthy weight before and throughout pregnancy with the aim to contribute to break the family pattern of obesity (Lwin, M.W., Timby, E., Ivarsson, A.2023).

Over 5,800 children between the ages of 6 and 10 participated in a large cross-sectional study conducted in Beijing that looked at the effects of sleep habits, including problems like inadequate sleep and sleep-disordered breathing (SDB), on growth and metabolic health. The findings showed some startling trends: SDB was linked to greater BMI, higher fat levels, and negative cholesterol levels, while poor sleep was linked to lower height and higher blood pressure. Notably, older children with SDB were more likely to have hypertension, while younger kids with inadequate slept were a greater possibility to overweight and have extra body fat. These results demonstrate the significance of improving children's sleep quality as a means of averting developmental problems and subsequent metabolic disorders (Chen, Y., Wu, L., Liao, Z. et al.2025).

Adiposity is acknowledged as an indicator of threat such as kidney failure, chronic kidney disease (CKD), but its influence on children's transplant decision-making is debatable. Although witn some reference that adipose kids have worse transplant results, many transplant centers use high BMI as a barrier to transplant availability, either completely or partially. Given that children frequently have little control over their diet, activity, and general health environment—all of which are influenced by their families and communities (Berkman, E.R., Richardson, K.L., Clark, J.D. et al., 2023).

Addressing childhood obesity is becoming more and more dependent on understanding how weight status runs in families, particularly in nations like Pakistan where there is a dearth of information on this relationship. There is a direct correlation between mothers' weight and the weight of their children under five, according to data from the National Health Survey in current research.For example, children between the ages of 2 and 5 who had moms who were overweight or obese tended to have higher weight-for-height scores. It's interesting to note that children under two did not exhibit this association, indicating that common environmental or lifestyle factors may have an impact on weight when kids get older. These results highlight the

necessity of encouraging moms and kids to adopt healthy behaviors together, as this may be a more successful approach to tackling childhood obesity in low- and middle-income communities (Alam, F., Ali, M.K., Patel, S.A. et al.2024).

School-based interventions are becoming more popular as a means of encouraging children to lead healthier lifestyles, as childhood obesity rates are rising in China. The impact of a comprehensive school program on fourth-grade students' obesity-related knowledge and behaviors was examined in the CLICK-Obesity study, a randomized controlled trial conducted in urban Nanjing. kids in the rehabilitation category after a year group showed promising improvements: they had better awareness of obesity risk factors, ate less red and white meat, increased their physical activity—particularly in ball games—and significantly reduced screen time. While the intervention didn't dramatically change all behaviors, these shifts point to the power of structured school programs in shaping healthier daily habits. The study illustrates how early, school-based lifestyle adjustments might promote obesity prevention (Zhou, HR., Wang, WW., Yang, HF. et al.2023).

In an effort to better understand how family dynamics impact children nutrition and obesity, more attention has been paid by researchers to the relationship between mother and kids weight history.A rising amount of research emphasizes the significance of taking into account familial and environmental factors, particularly in early infancy, even if the majority of the literature to date has been on individual-level interventions. In South Asian contexts, such as Pakistan, such data are still rare. By demonstrating a definite positive correlation in relation to mother and kid body mass index weight-for-height, especially among kids ages 2-5, current study offers important new information. These results are consistent with international studies that indicates parents nutrition, lifestyle, and weight has a major influence on kids wellness. The fact that there is no relation between kids under age two highlights the intricacy of early-life growth patterns and the possibility of varying nutritional impacts during infancy. For effectively managethe increasing prevalence of adiposity,study emphasizes the necessity of family-centered public health programs that address mother and child nutrition jointly rather than separately (Alam, F., Ali, M.K., Patel, S.A. et al.2024).

It has been demonstrated that there is a high correlation between the risk of childhood adiposity and the prevalence of maternal adiposity throughout conception and the initial year of an infant's life.according to recent studies. This points to a strong inter-generational connection that goes beyond heredity and could be influenced by environmental and lifestyle variables. On the other hand, there is inconsistent evidence about paternal smoking during pregnancy. Even though the majority of research suggests a potential link between father smoking and an increased risk of childhood obesity, at least one study showed no meaningful correlation, underscoring the need for more research into the underlying mechanisms (Hussain, U., Ziauddeen, N., Taylor, E. et al.2025).

Poverty and childhood obesity are closely related; numerous studies have demonstrated that obesity is more common in kids from families with few resources.Although this connection is obvious, it is far more difficult to determine whether lowering poverty may truly prevent obesity. Due to practical and ethical considerations, traditional studies such as randomized controlled trials are not always feasible in this field. To better understand how poverty affects childhood obesity, researchers are using innovative, practical methods, such as comparing identical groups before and after an intervention or examining the effects of policy changes across time. Scientists may now investigate how these effects operate and who gains the most thanks to newer techniques. Some tools, for instance, employ machine learning to identify which children are most impacted by poverty reduction initiatives, while others help identify the precise ways that additional income might enhance a child's health. The evidence is conflicting, though. Numerous factors contribute to

childhood obesity, and even well-meaning initiatives may have unanticipated repercussions. In the future, more intelligent research techniques can assist us in developing more solid evidence to support the development of policies that genuinely promote the health of children, particularly in the areas most affected by poverty (Liang, R., Goto, R., Okubo, Y. et al. 2025).

The prevalence of overweight kids is on growing worldwide health issue that affects kids emotional and social development in addition to their physical health. The fact that obesity is impacted by a complicated interaction between genetic, behavioral, environmental as well as societal elements has become evident as the rates continue to grow. Addressing ADHD necessitates a compassionate, all-encompassing strategy that supports the child and their family as a whole, not just dietary and exercise recommendations. Psychological techniques, especially those that emphasize patient-centered care, have become vital resources for assisting kids in changing their lifestyles for the better. These methods place a strong emphasis on teamwork, empathy, and motivation—involving families and kids in the therapeutic process in addition to medical professionals. We may establish more supportive environments where healthy habits can flourish by utilizing evidence-based practices such as family-based interventions and cognitive-behavioral therapy, as well as by cultivating close relationships between caregivers and medical providers. This chapter clarifies the psychological aspects of obesity treatment, demonstrating how individualized, team-based approaches and mental health assistance can significantly impact a child's path to improved health (Ramalho, S.M., etal.,2024).

An increasing number of children in China are suffering from childhood obesity, making it most urgent health issues facing the nation. Causes of obesity, including as food, exercise, and screen time, have been the subject of much research, but less focus has been placed on what parents genuinely desire or anticipate from programs aimed at preventing it. Given that parents frequently make decisions regarding their children's health, this is a significant gap. In order to better understand people's preferences for health interventions, researchers have begun employing techniques like discrete choice experiments (DCEs) all over the world. However, in the context of juvenile obesity in China, this approach is still relatively new.Prior research has demonstrated that health programs are typically more successful when they represent the interests and values of families. By asking Chinese parents what they value most in a program to reduce childhood obesity, this study helps close that gap. The findings show that diet, sleep patterns, and cost are the main issues, indicating that effective programs must be reasonably priced, encourage sound sleep habits, and support balanced eating—all the while meaningfully integrating parents (Ma, X., Liu, T., Yu, J. et al. 2025).

In Riyadh, Saudi Arabia, childhood obesity is becoming a pressing problem, but cultural and social attitudes have a significant influence on how parents perceive and react to it. A bigger child is still viewed as healthy and well-fed in many households; this belief has its roots in tradition. This perspective, however, frequently starts to shift when parents see their kids dealing with actual difficulties, such as bullying, falling behind their peers, or health issues. According to research, parents don't always have the time, information, or assistance necessary to properly control their child's weight. This study supports mounting evidence that parental attitudes can be influenced by lived experiences, even while societal standards continue to have a significant impact. It also emphasizes nurturing surroundings that assist parents in encouraging their kids to lead healthier lives (Almutairi, S.H., etal.,2024).

The increasing rate of childhood and teenage obesity in Ecuador draws attention to a pressing public health concern that necessitates focused intervention. According to this study, which is based on data from a national survey, about 13% of youths between the ages of 5 and 17 suffer from obesity. Crucially, it demonstrates that the risk of obesity is not uniformly distributed and is impacted by a variety of lifestyle

and societal factors. Particular geographic areas, such as the coast and insular regions, and kids from households with lower incomes are more prone to impacted.

Protective factors, on the other side, include eating vegetables every day, being an adolescent (as opposed to a younger child), having a more educated family breadwinner, and participating in frequent physical activity. These results highlight the need for regionally and culturally appropriate health policies in Ecuador that address social injustices, increase access to wholesome food, and encourage physical exercise. Adapting therapies to these circumstances can lower obesity rates and enhance the long-term health of young people in Ecuador (López-Gil, J.F., Chen, S., López-Bueno, R. et al. 2025).

In Iran, overweight and obesity are becoming more serious health issues that impact people of all ages. This umbrella review offers a thorough examination of the prevalence of various illnesses across the nation by synthesizing results from 24 meta-analyses. Nearly one in five Iranians are overweight, and more than one in ten are obese, according to the data. Although prevalence rates are highest in adults, children and adolescents are also affected, particularly boys, who have greater rates than girls in younger age groups. Adult women, on the other hand, are more impacted than men. These results underline the necessity for specialized public health interventions by showing that obesity is not only a common problem but also differs by age and gender. There is an urgent need for national and regional policies centered on prevention, healthy lifestyle promotion, and early intervention especially targeting adolescents to stem the progression into adulthood because the growing trend poses a major danger to long-term health outcomes (Dehghani, A., Molani-Gol, R., Mohammadi-Narab, M. et al.2024).

By looking at a group of kids This cohort comes from the Sweden longitudinal research Project of Infant Adiposity. study offers valuable insights. Children with subclinical hypothyroidism had far greater amounts of triacyl glycerides, a crucial cardiovascular risk factor, even though the disease did not seem to have an impact on basal metabolic rate. Even after controlling for age, sex, changes in BMI, and thyroid hormone levels, variations in thyroid-stimulating hormone (TSH) were linked to increases in total cholesterol and LDL cholesterol over time. Remarkably, without medical intervention, TSH naturally returned to normal in most children with subclinical hypothyroidism within a few years. According to these results, subclinical hypothyroidism in obese children may affect lipid metabolism and raise long-term cardiovascular risk even if it may not directly affect metabolic rate (Tersander, B., Olsson, R., Aydin, B.K. et al.2024).

Adiposity in kids and teenagers are growing as public health concern in Peru; between 2006 and 2016, the prevalence increased from 22.7% to 27.0%. This study emphasizes the significant long-term economic burden that chronic illnesses impose in addition to their health consequences. According to a Markov cohort model, researchers calculated that by 2092, the direct and indirect costs of childhood obesity in Peru might total 210.6 billion USD if nothing is done. The study assessed four evidence-based strategies to combat this: breastfeeding assistance, school-based social marketing, healthy eating regulations, and fruit and vegetable subsidies for low-income groups. In addition to providing substantial health advantages, these tactics have high economic value, with a return on investment (ROI) of up to 164.1 USD for every $1 invested over a 66-year period. The results show that early, sustained expenditures in health can have significant societal and financial returns, and they strongly justify the urgent expansion of national programs to prevent and reduce childhood and teenage obesity (Ugaz, M.E., Meyer, C.L., Jackson-Morris, A.M. et al.2024).

Obese children are more likely to develop nonalcoholic fatty liver disease (NAFLD) and inflammation has a significant role in the development and course of this illness. The possibility for non-alcoholic fatty liver disease prediction using the monocyte to

high-density lipoprotein cholesterol ratio (MHR), a recently identified measure of chronic inflammation (Zhang, Jf., Cai, Fq., Zhang, Xc. et al.2024).

Although there has been much advertising for breastfeeding's preventive benefits against being overweight, most studies have focused on longer breastfeeding durations, making it less clear how short-term nursing (six months or less) affects children. In order to close that gap, this study compares Children that were ever nursed for a short time to those who were never breastfed, using a large U.S. sample of kids between the ages of two and six from the NHANES dataset (2009–2020). In general, breastfeeding for a brief period of time did not considerably reduce the risk of obesity in whole community. However brief nursing sessions were linked to a significantly decreased occurrence of adiposity in some categories, especially children of older mothers and children ages 3–4. By demonstrating that delayed introduction of formula in breastfed infants and delayed introduction of milk or cow's milk substitutes in non-breastfed children were linked to lower obesity risk, the study further emphasized the significance of early dietary practices. These results imply that the type and timing of early feeding are important factors in pediatric obesity prevention methods, and that even brief breastfeeding may have advantages in certain situations (Zhou, M., Hu, L., Li, F. et al.2024).

Globally, Kids adiposity is becoming more substantial issue with effects over time for adult health. This study examined how parental smoking, especially mother smoking, may increase the occurence of kids adiposity in Australian kids ages 4 to 16. Regardless of the family's size, income, or other characteristics, the data demonstrated a strong correlation rising rates of juvenile obesity and smoking by parents. Interestingly, the research also discovered that children of smokers typically eat more unhealthy foods, which may help to explain some of the elevated risk for obesity. These results emphasize how crucial it is to address parental smoking as part of initiatives help decrease obesity in kids and encourage kids' healthier eating habits (Srivastava, P., Trinh, TA., Hallam, K.T. et al.2024).

The issue of childhood obesity is becoming more widespread worldwide, and many kids who begin weight-management lifestyle programs end up quitting too soon. This study's goal was to ascertain the potential causes of children quitting these programs too soon. Data from 159 kids between the ages of 4 and 17 who took part in an approach to life focused on the family in Denmark from study of three years examined by the researchers. They discovered that older kids were more likely than younger kids to drop out of the program over the first 18 months. Actually, the length of therapeutic measure for older children was much shorter, and this tendency was inversely correlated with the age of the children at the beginning of the program. The findings demonstrate that a child's age has a significant impact on whether or not they stick with a weight-management program (Jørgensen, R.M., Bjørn, A., Bjørn, V. et al.2023).

This study tracked the effects of early-life activities and living situations on the BMI of 485 Samoan kids from two to nine years old. According to the consequences, some characteristics, such as following a contemporary diet, having a wealthier household, and residing in an urban area, were associated with increased BMI and quicker weight gain, particularly in girls and boys who lived in cities. Interestingly, from age 3 forward, children who were more physically active also had somewhat higher BMIs; however, by age 9, these differences were no longer statistically significant. The findings imply that nutrition and socioeconomic background have an impact on unhealthful weight growth, which begins early in life (Choy, C.C., Johnson, W., Naseri, T. et al. 2025).

This Japanese study contributes to the increasing amount of data that shows there is a correlation between obese children's risk and aesarean section (CS) births. Researchers discovered that infants born via caesarean section had a slightly higher chance of becoming fat by the age of three than children born vaginally, based on data

from more than 60,000 mothers. Specifically, after controlling for potential confounding variables, A 16% higher incidence of obesity was associated with CS birth. Considering the increased incidence of obese kids and the growing frequency of caesarean sections, the results are noteworthy even though the increase in risk is rather minor. A wider, potentially biological or microbiome-related explanation is suggested by this study, which also shows that the correlation seen in other populations seems to remain true in the Japanese environment (Terashita, S., Yoshida, T., Matsumura, K. et al.2023).

Undernutrition and obesity in the same child, known as the the dual burden of starvation in kids is a new and complicated problem, particularly in low-income nations like Ethiopia. To ascertain the frequency and risk factors for childhood stunting and obesity (CSO), under five, this study used national data from 2005, 2011, and 2016. Despite being very modest (1.33%), the prevalence changed over time and indicated important risk factors. CSO was more common among children who lived in smaller families, were currently breastfeeding, or were born to moms who were overweight. Variability among survey years was also seen in community-level patterns, underscoring changing dynamics in child nutrition. According to these findings, public health initiatives should take a multifaceted strategy, addressing both types of malnutrition rather than just undernutrition or obesity separately. Effectively addressing this double burden in Ethiopia requires early identification and support of children who are at risk, especially those living in contexts where risk factors overlap (Sahiledengle, B., Mwanri, L., Kumie, A. et al.2023).

Childhood obesity continues to rise, with racial disparities emerging as early as infancy—disparities that are deeply entwined with racism's pervasive impact. Research reveals that racism influences a child's health even before birth, shaping intergenerational and prenatal environments through systemic inequalities, chronic stress, and unequal access to care. As children grow, the neighborhoods they live in, the quality of their schools, and their access to healthy food and safe play spaces are all filtered through a lens of structural racism. Furthermore, the interactions between healthcare providers and families are not immune to bias—both implicit and rooted in historical mistrust—further complicating prevention and treatment efforts (Lawton, etal.,2024).

Childhood obesity is significantly influenced by socioeconomic class (SES), although the link varies and differs depending on a nation's level of affluence. Lower SES is frequently associated with higher childhood obesity rates in wealthier nations, whereas the inverse is typically true in lower-income nations. Early childhood nutrition, parental habits, and particularly parental education and weight status are some of the elements that influence this relationship. The likelihood that a youngster may become obese can be affected by these SES-related factors from an early age. However, because SES has several layers and many definitions, it is difficult to analyze this link. It is obvious that SES must be taken into consideration in interventions meant to lower childhood obesity (Vazquez CE, Cubbin C. etal., 2020).

In Costa Rica, childhood obesity and overweight are becoming major public health issues, with some regions having very high rates. In order to investigate how location and socioeconomic factors affect the this research examined the prevalence of childhood obesity in kids ages under 12 years. employed spatial analysis. Interestingly, there was a U-shaped pattern to the connection between adiposity and education: obesity increased with average years of schooling up to roughly eight years, after which it started to fall. Conversely, a district's slightly lower obesity rates were associated with higher poverty levels and a larger percentage of young people living there. Geographically, obesity was more widespread in central regions, tourist-heavy areas, provincial capitals, and districts bordering the Panama border (Gómez MJ, etal.,2023).

A major global public health problem now is childhood obesity, including in countries

with low to middle incomes like Tunisia. The number of preschool-aged children who are overweight or obese has alarmingly increased due to a complex interplay of genetic, behavioural, and Surrounding factors,according a recent research conducted in a number of different locations. Higher rates of childhood obesity have been repeatedly associated with sedentary lifestyles, bad eating patterns, particularly greater consumption of calorie-dense snacks, and parental influence, including obesity and metabolic diseases such dyslipidemia. Furthermore, early life experiences like recurrent hospital stays or certain medical histories may also be linked to irregular eating behaviours and weight gain. The research highlights the importance of early detection and intervention, especially during the preschool years when parental engagement has the most impact and lifestyle habits start to form. Reducing the childhood obesity epidemic requires addressing these multifactorial hazards through family education, community-based awareness campaigns, and better school environments (Naifar M, etal., 2023).

Globally, there is growing worry over childhood obesity, especially among socially vulnerable communities. According to a review of the literature, a wide range of social vulnerabilities—including parental unemployment, a lack of social support, being a minority or immigrant, having a negative childhood experience (such as abuse, neglect, or dysfunction in the home), gender inequality, and nontraditional family structures—significantly increase the risk of obesity beyond traditional socioeconomic status (SES) indicators. These weaknesses have an impact on kids' mental health, raise stress levels, and interfere with good habits like eating, exercising, sleeping, and using screens. Crucially, the consequences of social vulnerabilities can happen on their own, even though SES may intensify or lessen these effects. There is evidence that the development of obesity in these populations is more likely to be caused by high-calorie diets fueled by stress and emotional dysregulation than by a lack of exercise. Despite the obvious connections, the effectiveness of most preventative initiatives is limited because they ignore the intricate social realities of children who are at risk. Though limited, therapies that are adapted to these social determinants demonstrate modest but encouraging results, underscoring the need for more inclusive, context-sensitive approaches to the fight against juvenile obesity (Iguacel I, Gasch-Gallén Á, Ayala-Marín etal.,2021).

The substantial influence of socioeconomic determinants of health on childhood obesity, especially among immigrant groups, is demonstrated by a recent research based on information from the National Health Survey of Spain in 2017. Study looked at kids under the ages of 14 years and discovered that kids of immigrant origin were significantly most probable to adipose as compared to native counterparts—40.5% vs. 29.5% for males and 44.8% vs. 30.3% for girls. Children from migrant families were still 67% most probable to adipose (OR = 1.67), instead of controlling of other variables. Additionally, the results showed that these kids were more prone to partake in unhealthy habits like excessive screen time, poor levels of physical activity, and heavy sugary drink consumption. These trends imply that public health initiatives need to go beyond general interventions and are strongly linked to wider socioeconomic disadvantages. Policies and programs should be tailored to particular needs of immigrant communities in order to eradicate health inequities and improve the wellness of kids.taking socioeconomic and cultural aspects into account (Moncho J, Martínez-García A, Trescastro-EM. etal., 2022).

There is mounting evidence that a baby's diet during the first few months of life can influence their likelihood of becoming obesity in the future. Perhaps because formula has more protein than breast milk, breastfeeding has been associated with a lower risk of childhood obesity. Researchers discovered that infants fed a lower-protein formula had lower body mass indices (BMIs) at the ages of two and six in a sizable study known as the Childhood Obesity Project. This appears to be related to the way that specific protein amino acids impact hormones like IGF-1, which have an impact on

fat accumulation and growth. The study also discovered that, once more linked to IGF-1, high-protein diets during infancy may result in larger kidneys. Although the body's ability to control fat is known to be influenced by hormones like leptin and adiponectin, only leptin has demonstrated a direct correlation with children's body weight, while adiponectin's function is yet unknown. All things considered, these results emphasize the significance of emphasizing quality rather than quantity in baby nutrition and show how early feeding decisions can impact a child's health in a lasting way (Socha P, Hellmuth C, Gruszfeld D, etal.,2016).

The incidence of kids adiposity rapidly increasing worldwide, mostly as a result of dietary modifications and an increase in intake of stored, unsafe, high-calorie meals.This article investigates whether improved food labeling could be a useful strategy to help stop childhood obesity. Effective front-of-pack labeling (FPL) can impact consumer decisions and lower the chances of many illnesses that are not communicable, including as obesity, based on an extensive evaluation of scientific literature. Current labeling schemes, however, sometimes fall short because they are difficult to read, unclear, or inaccessible because of inadequate health literacy and language hurdles. Effective models, such as Chile's warning label system, demonstrate how families can be guided toward healthier food choices by labels that are easy to read, clear, and conspicuous. Adopting a more consumer-friendly food labeling system could be a straightforward yet effective step toward combating juvenile obesity in nations like India, which have high literacy rates but linguistic variety. Food labels are an essential component of the greater public health conundrum, even if the problem cannot be resolved by them alone, according to the data (Bhattacharya S, Saleem SM, Bera OP. etal.,2021).

Globally, childhood obesity remains a severe and expanding issue in spite of several preventative initiatives. Obesity is more than just gaining additional weight; Obese kids are far more vulnerable to experience major wellness problems like diabetes and heart disease, even at an early age. Early indicators of heart disease and other issues can appear well before adulthood, and the earlier obesity begins, the longer the body is exposed to negative effects. Early detection and management of these health hazards is crucial, according to experts from the Paediatric Endocrine and Diabetes Association of Italy. In children who are overweight or obese, they advise routinely screening for associated illnesses such as hypertensive, gestational diabetes, hepatic disease, sleep problems and even kidney disorders. Hazards can be reduced by promoting weight loss by healthy lifestyle choices and, if required, the use of medications. The message is clear: in order to safeguard these children's long-term health, we must take early action, treat more than just their weight, and continue to monitor them (Valerio G, Di Bonito P, Calcaterra V, etal.,2024).

Childhood obesity and overweight are becoming serious public health issues because of the long-term burden they inflict on society in addition to the health issues they create. Approximately 50% of children who are obese will remain so as adults, and the risk increases if obesity persists throughout adolescence. From the time of birth to until turns 2 years are a crucial period that might influence a child's long-term metabolic health, according to research. A child's risk of being overweight during this time influenced by different factors, the mother's wellness, the circumstances surrounding her pregnancy, and early feeding habits. Early identification of children who are more vulnerable is crucial. It is feasible to stop obesity before it starts and provide kids a healthier future if families receive timely support and instruction on how to develop healthy behaviors from an early age (Pailler M, Thibault H, Lamireau T. etal., 2022).

According to a systematic assessment of 51 studies involving about 98,000 Saudi teenagers, In addition to being highly prevalent, adiposity also rising continuously. Numerous social determinants, including familial environment, socioeconomic position, lifestyle choices, and community impacts, were also found to be closely

associated with adolescent obesity. To further understand how these various social elements interact and contribute to the issue, researchers created an ecological model. This model highlights the necessity for all-encompassing approaches that go beyond individual behavior and offers a helpful structure for examining the many factors contributing to adiposity in kids in Saudi Arabia Public health initiatives that address these wider socioeconomic factors will be necessary to effectively combat adolescent obesity in Saudi Arabia (Habbab RM, Bhutta ZA. etal.,2020).

A number of severe health problems that can start early and get worse over time are frequently associated with childhood and teenage obesity. In order to determine the prevalence of these linked health issues, or comorbidities, and the characteristics that may predict them, this study examined 158 obese kids under the ages of 6 to 18. According to consequences, many of these kids already had vitamin D insufficiency (64.2%), insulin resistance (45.1%), aberrant blood fats (32.2%), high blood pressure (15%), and high uric acid (18.5%). Crucially, the likelihood of these issues was associated with age, sex, body fat percentage, and the degree to which their BMI was higher than normal (BMI Z-score). The risk was larger for boys, older kids, and people with more body fat. In order to inform more focused and prompt therapies, these findings emphasize the significance of both identifying obesity and doing early screening for related health risks (López-Galisteo JP, Gavela-Pérez T, etal., 2022).

Using all three major international standards to determine weight status, this Montenegrin national study provides a comprehensive overview of childhood obesity in a nation going through economic change. Over 4,000 kids under the ages of 14 years found to be more than mormal weight, with a higher prevalence among males than girls (7.0% vs. 3.5% obese). Additionally, the study found a number of important variables linked toa higher incidence of juvenile adiposity. These added being overweight at birth, having fewer siblings, smoking by the mother, having obese parents, particularly the mother, and playing video games more. However, there seems to be some protection in being older, female, having more siblings, or being later in birth order. These results demonstrate the intricate interplay of behavioral, biological, and familial factors that affect childhood obesity. Additionally, they stress the significance of tracking and comparing obesity trends across nations using uniform international criteria, particularly in areas where lifestyles are changing quickly (Martinovic M, Belojevic G, Evans GW,etal.,2015).

This UK study demonstrates how a mother's weight gain in between pregnancies can affect her second child's risk of obesity. In comparison to children whose mothers maintained a stable weight, children born to mothers who gained three or more BMI points between pregnancies were significantly greater likelihood of becoming fat, with the passage of time they were four or five years old, according to research that examined the health records of nearly 4,800 women and their first two children. Mothers who gained moderate to significant weight before to their second pregnancy but were of normal weight during their first were particularly at risk. According to these results, a child's health may suffer long-term consequences from even modest weight gain in between pregnancies. It may be possible to lower the chances of childhood adiposity, enhance the both mother child wellness by helping women to return to their normal weight after giving birth and refrain from gaining too much weight before getting pregnant again (Ziauddeen N, Huang JY, Taylor E, etal., 2021).

Asian American communities, who have sometimes been disregarded in public health conversations, are among the US cultural and ethnic diversity who are increasingly concerned about childhood obesity. Asian American children face particular risk factors related to their cultural and social experiences, according to a study of 14 studies. For example, children from immigrant families may eventually develop less healthful eating habits, suggesting that acculturation and generational position are important factors. Children's weight outcomes are also influenced by family factors, including parenting practices and routines in the home. Despite these significant

discoveries, there is still a dearth of research in this field; the variety within Asian American subgroups is not given enough attention, and many studies use tiny, non-representative samples. The majority of research on children is focused on Chinese and Hmong American children, excluding many other ethnic groups. Additionally, not many studies make use of theoretical frameworks or qualitative methodologies that could expand our knowledge. More complex, culturally aware research that takes into account the diverse nature of Asian American communities and their particular difficulties in combating childhood obesity is obviously much needed (Lu W, Diep CS, McKyer LJ. etal.,2015).

Obesity among kids has become an international epidemic, With an estimated 41 million kids under the threshold of 5 affected by adiposity worldwide. In middle income nations, where rates have increased recently, the issue is particularly concerning. More and more kids are starting school already dealing with obesity, which emphasizes the importance of comprehending and helping early in life. Numerous modifiable risk factors have been identified by research as having the ability to influence obesity outcomes starting in infancy. In addition to early feeding habits including breastfeeding, the timing and kind of complementary foods, and feeding behaviors, they also include parental impacts, such as maternal obesity and gestational diabetes. Lifestyle factors also play a part, including sleep patterns, screen time, physical activity, and even prenatal exposures like mother smoking. Significant research gaps still exist despite our expanding awareness of these early-life effects, highlighting the need for additional studies that examine effective ways to lower these risks and promote better starts for kids worldwide (Mihrshahi S, Baur LA. 2018).

An increased probability of adipose kids with associated chronic diseases closely associated with childhood obesity, an increasing global health concern. Numerous studies demonstrate the crucial significance of early-life factors on subsequent weight outcomes, including a sizable prospective cohort study in New Zealand that involved over 5,700 children. This study emphasizes how a number of modifiable factors, including frequent takeout food and sugary drink consumption by age two, excessive screen time, inadequate sleep, and food insecurity in adults are independently associated with an elevated level of adiposity by age 4.5. With adjusted risk ratios ranging from 1.22 to 1.32, the study specifically indicated that reduced food security, more than an hour of screen time per day, less than 11.5 number of hours slept each day, and weekly or frequent consumption of unhealthy foods greatly increased the risk. Remarkably, up to 43% of preschool-aged obesity diagnoses might be avoided if all of these risk factors were addressed early. These results highlight the critical need for family-centered, early interventions that support good sleep patterns, limit screen time, increase food accessibility, and promote wholesome eating practices long before kids are ready for preschool (Malihi Z, Portch R, Hashemi L, etal.,2021).

Obesity in kids doesn’t just arise overnight—it’s a condition molded by multiple factors that begin well before a youngster takes their first steps. Recent studies in Mexico have begun to solve the puzzle of what poses a risk to very young infants, those under two. According to a review of studies using a framework called the Six-Cs model, which examines impacts from inside of cells to the wider society, Study has mostly concentrated on the kid and society,giving much less consideration to the potential implications that culture, society and country may play. A high birth weight, a cesarean delivery, or poor feeding habits during infancy were some of the early warning signs for obesity. Parenting under stress and mothers who battle obesity themselves or who fail to identify when their kid is overweight also appeared as significant risk factors. The risk was increased by living in urban areas, experiencing food instability, and growing up in settings where ultra-processed foods are popular and even encouraged. Growing interest in this field is good, but the research also indicates that we're just beginning to comprehend how larger cultural and societal systems contribute to obesity. We must start tackling the surroundings in which

toddlers grow, eat, and live in order to make a real difference, moving beyond the person and family (Castro-Sifuentes D, Cárdenas-Villarreal VM, etal.,2023).

A study comparing youngsters in Germany and Ukraine provides insight into the common and distinct risk factors driving the global increase in childhood obesity. Researchers examined children between the ages of 8 and 18 and discovered that although many risk factors, such as the impact of maternal weight and pregnancy problems, were similar in both nations, others differed. For example, German children were more likely than their Ukrainian counterparts to be obese by the age of one and to stay overweight for an extended duration. It's interesting to notice the Ukrainian group had a lower prevalence of family history of diabetes, and obese Ukrainian youngsters had lower BMI scores overall. Notwithstanding these variations, both groups displayed raised blood pressure and high waist-to-height ratios as indicators of cardiometabolic risk. Instead of using a one-size-fits-all strategy, these findings emphasize the significance of adjusting weight loss prevention and treatment plans to the unique risk patterns of each group (Yakovenko V, Henn L, Bettendorf M, etal.,2019).

A comprehensive evaluation of studies involving over 200,000 children in 27 countries found that between 2006 and 2016, almost A fifth kids in Europe under the threshold of two and seven suffered from obesity. A study shows, 5.3% of children were specifically categorized as obese, and 17.9% of kids were obese. Regional differences highlighted with the fact that children with the highest prevalence of extra pounds was seen in Southern European nations. These results highlight critical need for early-life treatments, especially in regions with the highest rates of childhood obesity. Reversing this expanding trend throughout Europe requires addressing food trends and encouraging healthy lives from an early age (Garrido-Miguel M, Oliveira A, etal.,2019).

Because of a complex interplay between inheritable, behavioural, and surroundings variables that start early in life, childhood obesity is becoming a global concern. Studies conducted in a number of countries, including Tunisia, Europe, Mexico, Germany, Ukraine, and New Zealand, show recurring trends: excess weight in children is largely caused by high-calorie diets, a lack of physical activity, eating habits like watching TV during meals, poor sleep, food insecurity, and obese parents. Additionally, studies reveal that socioeconomic and cultural elements—like urban life and processed food preferences—are important yet are still poorly understood in many nations. Although biological predispositions are important, a child's upbringing—including family customs, local resources, and national food systems—has a significant impact on their health. These results repeatedly highlight the need for early, family-based strategies and measures that are adapted to the social circumstances of each population in order to combat childhood obesity (Mahjoub F, Ben Amor N, Rachdi R, Mizouri R, Zaier A, etal., 2024).

Both underweight and childhood obesity are serious health hazards that are becoming more prevalent worldwide, especially developing nations like Palestine where they currently live together. With accordance to research conducted in Palestine, combined occurence of underweight and adiposity in school-aged kids elevaed to 37.5% in a matter of years, which is a far higher rise than the decades-long global average. Overweight and obesity are considerably more prevalent, affecting roughly 15% and 16% of children, respectively, compared to 7% of underweight children. The study also discovered a substantial correlation between a child's weight status and variables like age, gender, living situation, and waist size. In the larger context of shifting diets and lifestyles in Palestinian communities, In order to ensure that kids do not just prevent overeating but also acquire enough food for avoiding skinny apperance, our research results underscore the urgent need for early, targeted treatments that deal with both extremes of the dietary range (Al-Lahham S, etal.,2019).

As early as age two, children with autism spectrum disorders (ASDs) are present in

obese. (approx 34%),approximately 5,000 children with ASD among large population were adipose and 18% were obese. These rates are much higher than those in the general pediatric population, especially for preschool-aged kids and non-Hispanic white children. A reseach also discovered many significant risk factors,such as older age, Hispanic or Latino ancestry, lower education among parents, sleep disorders, and emotional or behavioral problems, that were similar to those observed in children who were typically developing. These results demonstrate that children with ASD might experience unhealthy weight gain in a different way and possibly sooner. These results emphasise the necessity of targeted, early treatments that deal with broader developmental as well as behavioral difficulties that may lead to weight concerns in addition to promoting healthy food and exercise habits, given the complex needs of children with ASD (Hill AP, Zuckerman KE, Fombonne E. etal., 2015).

In both high- and low-income nations, childhood hypertension has alarmingly increased in tandem with the continuous growth in childhood obesity over the past few decades. This expanding public health concern reflects not only similar patterns but also a complex relationship— hypertensive kids are significantly more likely to be overweight. Recent research has improved our knowledge of how obesity causes hypertension at a young age, especially in the wake of the 2017 revision of the American Academy of Peads' BP recommendations, which decreased the thresholds for what is deemed excessive. Changes in insulin resistance, inflammation, kidney function, and nervous system modulation are some of the intricate mechanisms underlying this association. As this study highlights, childhood obesity-related hypertension is not only more prevalent than previously thought, but it is also complex, making early prevention and intervention measures more crucial than ever (Myette RL, Flynn JT. etal.,2024).

According to a study from the southern Iranian province of Fars, childhood fat is still a significant indicator of hypertensive condition in young people. Researchers discovered that 7% of 2,000 healthy students between the ages of 11 and 17 were fat, and nearly 12% had hypertension. Significantly, there was a direct correlation between higher body mass and hypertension,confirming the robust link with kids fat with hypertension. Remarkably, the child's blood pressure was not significantly impacted by the mother's educational attainment. Over the previous five years, the region's obesity rates have been mostly unchanged, but the sharp rise in hypertension highlights the critical need for quick action. These results emphasize how crucial it is to prevent and treat juvenile obesity as a means of reducing the rising prevalence of pediatric hypertensive and the long-term health hazards associated with it (Basiratnia M, Derakhshan D, etal.,2013).

According to a study done in Chandigarh among teenagers aged 10 to 14, obesity in children is becoming a more serious problem in India, especially in metropolitan areas. The study, which included more than 1,000 pupils from both public and private schools, found that, according to the Indian Association of Pediatrics' BMI guidelines, almost one in four kids were either overweight (9.9%) or obese (14.0%). Although significantly higher in girls, the rates for obesity were comparable for both sexes. Crucially, the study also revealed definite correlations between factors including sex, income level, and sports participation and the risk for becoming overweight levels—reflecting worldwide trends. These results highlight the critical need for focused health interventions in communities and schools (Singh DP, Arya A, Kondepudi KK, etal.,2020).

Given that the prevalence of kid’s fat predicted to soon top of global rankings, Australia faces a serious public health concern. This trend has a bad effect in young Australians' wellness, according to a comprehensive analysis of studies conducted between 2004 and 2014.A study discovered that fatty kids are most probable to face cardiometabolic disorders, liver diorders and variety of mental health difficulties including worry, low self-esteem, and a diminished standard of living. In contrast to

other nations, Australia still lacks enough research on a number of the possible health effects of kid obesity, despite these alarming findings. This disparity emphasizes how urgently additional regional research is needed to fully comprehend the environmental, societal, and personal elements that contribute to obesity. Only with this understanding will Australia be able to effectively design policies and initiatives to reduce the rising disease burden, both domestically and as a template for other countries dealing with comparable issues (Sanders RH, Han A, Baker JS, Cobley S. etal.,2015).

CHAPTER 3
MATERIALS AND METHODS

The prevalence and risk factors for childhood obesity in children under the age of twelve were evaluated in this study using a cross-sectional research approach. Through random sampling, 210 participants in all were chosen, guaranteeing a representative sample of the intended audience. A varied sample from both healthcare and educational contexts was made possible by the data collection, which was carried out at Sacred Angel School and Children's Hospital in Faisalabad. In compliance with ethical standards to protect privacy and confidentiality, formal informed approval was acquired from each participant's parents or legal guardians.

Children under the age of twelve who were enrolled in the chosen hospital and school were among the participants. The study excluded children with developmental problems, chronic diseases, or known genetic syndromes to prevent misleading effects on the evaluation of risk factors associated with obesity. The World Health Organization's (WHO) guidelines for classifying children's growth and obesity were adhered to in this study.This was a cross sectional study and conducted in district of Faisalabad.

Sample size:

Based on prevalence estimates and the required statistical power, a total of 210 participants was gathered through recruiting at community centers, and public, private schools. Convenient sampling technique was used to collect data.

Inclusion Criteria:

Children, with the age group of 0-12 years.

Children with no serious medical issues that affect their weight, such as metabolic disorders or chronic illnesses.

Children who are categorized as overweight (BMI > 25 kg/m2) or obese (BMI ≥ 30 kg/m2).

Children with BMI that is at or above the 85th percentile for their age and sex.

Exclusion Criteria:

Children older than 12 years at the time of assessment.

Children who have been diagnosed with illnesses that may have an impact on their weight, such as severe chronic illnesses, endocrine disorders, or genetic disorders.

Children on medication that may have an impact on weight (such as corticosteroids or some antidepressants).

Underweight children with a BMI below the 5th percentile for age and sex.

Children with a BMI below the 85th percentile, not considered obese or overweight.

Children with a BMI above the 99th percentile for age and sex, as they may require specialized medical care not covered in the study.

Materials:

In order to determine the prevalence of childhood obesity and its risk factors in children under the age of twelve, this study used a cross-sectional study design. To guarantee a representative sample of the population, a total of 210 participants were

chosen at random from a variety of pediatric clinics, sacred angel school and children hospital Faisalabad.
In compliance with ethical norms for research involving children, informed consent was sought from each child's parents or legal guardians before to participation. All participants' privacy and confidentiality were rigorously protected during the study. Children ages 1 to 10 were eligible participants, and anthropometric measurements (height, weight, and BMI) were taken in accordance with WHO growth criteria.
To reduce bias in detecting behavioral and risk factors related to the environment, children with congenital diseases, chronic illnesses, or those already taking medications known to affect appetite or weight were excluded.

Samples Collection:
Children under the age of twelve in Faisalabad participated in this study; participants were chosen from Sacred Angel School and Children's Hospital in Faisalabad. 210 kids in all were chosen at random for inclusion. To prevent confounding variables in the analysis, children with known developmental difficulties, chronic diseases, or genetic disorders were not included.
A standardized questionnaire that parents or guardians completed was used to gather data. Important topics like demographics, breastfeeding history, physical activity, screen time, sleep length, dietary habits (including consumption of junk and good foods), and family background were all included in the questionnaire. Additionally documented were the parents' opinions regarding their child's general health and degree of activity. In addition to the research, each child's weight and height were recorded using normal methods, and their classification based on WHO BMI-for-age growth charts was used to determine if they were overweight.
The questionnaire took about ten minutes on average to complete. Chi-square and independent t-tests were used to investigate the relationship between childhood obesity and its possible risk variables after data were analyzed using SPSS software. Statistical significance was established at a level of $P < 0.05$.

Data Collection and Analysis:
An Excel sheet with the gathered data was examined for any missing or insufficient answers. A standardized approach was used to score each response. Additionally, subscale scores were computed. This procedure made it possible to accurately analyze the risk variables associated with obesity. For statistical testing with significance at $P < 0.05$, SPSS was utilized.

Demographic Information:
The child's age, gender, birth weight, and the parents' occupation and level of education were all disclosed by the parents. This made it easier to evaluate the potential effects of family and socioeconomic factors on childhood obesity. Children were categorized into risk groups with the use of data. Comparisons between various population subsets were supported. Other parts were built upon this knowledge.

Dietary Habits:
The child's eating habits, including meal frequency, intake of fruits and vegetables, junk food, and sugary snacks, were discussed in this section. Parents reported eating a normal amount of food throughout the day. Finding unhealthy eating habits was the goal. Additionally, regular breakfast and snacking behaviors were evaluated. The findings confirmed the connections between diet and obesity.

Screen time and physical activity:
On school days and weekends, parents were questioned about their child's screen usage and degree of physical activity. The time spent doing sports or playing outside

was measured via the questionnaire. It was also observed how the parents perceived the child's degree of activity. Low levels of physical exercise and excessive screen time were noted as the main issues. The impact of these practices on obesity was examined.

Sleeping Habits:
Data on the child's typical sleep duration on weekends and school days was collected in this section. Sleep is essential for weight control and healthy growth. Sleep habits were seen to be irregular or inadequate. Included were observations of sleep patterns made by parents. Data aided in determining if sleep and the risk of obesity are related.
Emotional and psychological aspects:
Parents responded to inquiries concerning their child's emotional health, stress, and mood swings that might be related to body weight. Examining any emotional strain associated with obesity was the goal. Emotions like worry or low self-esteem were seen. This made it easier to evaluate how being overweight affects mental health. The behavioral analysis gained depth from this section.

Support and Social Activities:
This section examined the effects of obesity on a child's social connections and peer and family support. Any behavioral changes or social disengagement were noted by the parents. Included were support networks such as family members' encouragement to eat healthily or exercise. The objective was to evaluate the ways in which obesity influences or is influenced by social life.

Awareness and Education:
Parents discussed what they knew and what they were doing to learn more about childhood obesity. Participation in any awareness campaigns or educational materials was one of the questions. It investigated if families actively look for health-related information. Involving parents in preventive and education was crucial. The importance of awareness in early intervention was emphasized in this section.

Statical Analysis:
To determine the prevalence and risk factors of childhood obesity in children under twelve, the gathered data was examined using SPSS (Statistical Package for the Social Sciences). The demographic data of the sample, such as age, gender, socioeconomic position, dietary habits, physical activity levels, family history of obesity, and other pertinent factors, were compiled using descriptive statistics. The possible correlation between these characteristics and the prevalence of pediatric obesity was investigated.
Using survey-based methods, behavioral characteristics that contribute to obesity, including eating habits, screen time, and sedentary activity, were assessed and tagged appropriately for analysis. The survey took an average of 15 to 20 minutes to complete, and the results were imported into SPSS for additional analysis.
A Chi-square test was employed for hypothesis testing in order to assess the relationship between the prevalence of childhood obesity and categorical factors, including eating habits, gender, and family history of obesity. The means of continuous variables (such as age and body mass index (BMI) scores) were compared between children who were obese and those who were not using an independent t-test.
To identify statistically significant relationships between various risk variables and childhood obesity, a significance limit of $P \leq 0.05$ was used for all statistical tests. Logistic regression analysis may also be used to concurrently detect and assess the impact of several risk variables.
The analysis's conclusions provide important light on the incidence of childhood obesity in children under ten and the underlying risk factors that contribute to its development.

Ethical Considerations:
The appropriate institutional review board (IRB) granted ethical permission for the study, and all participants' parents or legal guardians provided their informed consent. The goal of the study, its voluntary nature, and the participants' freedom to discontinue participation at any moment were explained to them. All survey data were anonymized to ensure confidentiality, and they were safely preserved and used only for study. In order to safeguard the identity of participants, only aggregated statistics were provided. To protect the children's privacy and well-being, ethical standards were adhered to.

CHAPTER 4
RESULTS
Section 1: Demographic Information
Table 4. 1 Frequency Distribution of Child Gender

Child Gender	N	%
Male	88	41.9%
Female	122	58.1%

In the present study, a total of 210 children were included. Among these participants, 88 were male, accounting for 41.9% of the total sample. The remaining 122 children were female, representing 58.1% of the sample. This indicates that female participants made up a larger proportion of the study population compared to males.

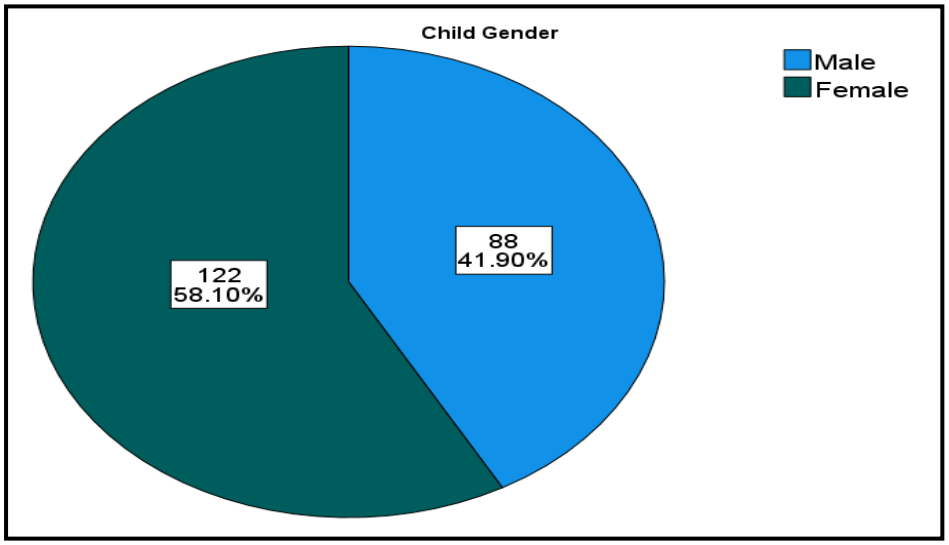

Fig 4. 1 Frequency distribution of gender

Table 4. 2 Frequency Distribution across Child Gender and Body Mass Index (BMI)

		Body Mass Index of Child									
		Underweight		Normal weight	in	Overweight		Obese		Total	
		N	%	N	%	N	%	N	%	N	%
Child Gender	Male	20	55.6%	32	56.1%	26	30.6%	10	31.3%	88	41.9%
	Female	16	44.4%	25	43.9%	59	69.4%	22	68.8%	122	58.1%
Total		36	100.0%	57	100.0%	85	100.0%	32	100.0%	210	100.0%

The data presents the distribution of Body Mass Index (BMI) categories among

children based on gender, with four categories: Underweight, Normal weight, Overweight, and Obese, across a sample of 210 children. Among the total, 88 (41.9%) were males and 122 (58.1%) were females. A greater proportion of males fell into the underweight (55.6%) and normal weight (56.1%) categories, while females were more prevalent in the overweight (69.4%) and obese (68.8%) categories. This suggests a gender-based variation in BMI status among children.

Table 4. 3 Association between Child Gender and Body Mass Index (BMI) Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.464[a]	3	.004
Likelihood Ratio	13.545	3	.004
Linear-by-Linear Association	9.904	1	.002
N of Valid Cases	210		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 13.41.

To statistically assess whether this variation is significant, a Chi-Square Test was conducted. The Pearson Chi-Square value is 13.464 with 3 degrees of freedom, and the p-value is .004, which is less than the conventional threshold of 0.05. This indicates a statistically significant association between child gender and BMI categories—in other words, the distribution of BMI is not the same for boys and girls in this sample. The Likelihood Ratio Chi-Square also supports this finding with a similar value (13.545) and the same significance level (p = .004). Additionally, the Linear-by-Linear Association test, which assesses a trend across ordered categories (in this case, BMI from underweight to obese), yielded a value of 9.904 with a p-value of .002. This reinforces the presence of a significant linear trend between gender and increasing BMI levels.

Table 4. 4 Descriptive statistics of demographics of child

	N	Mean	Std. Deviation
Child Birth Weight (Pounds)	210	7.667	1.330
Age of child	210	7.476	3.116
Height in cm	210	124.740	18.005
Weight in kg	210	28.161	8.942
Body Mass Index kg/m^2	210	17.771	3.195

The demographic characteristics of the children in the sample (n = 210) revealed a mean birth weight of 7.67 ± 1.33 pounds. The average age of the children was 7.48 ± 3.12 years. Their mean height was 124.74 ± 18.01 cm, and the mean weight was recorded as 28.16 ± 8.94 kg. Based on these measurements, the calculated mean Body Mass Index (BMI) was 17.77 ± 3.20 kg/m². These values provide a general overview of the physical growth parameters within the study population and serve as an important reference for assessing health and nutritional status.

Table 4. 5 Descriptive statistics of demographics of child's Father

	N	Mean	Std. Deviation
Father Height in cm	210	169.820	7.075
Father Weight in kg	210	71.696	9.423
Father BMI in kg/m^2	210	25.004	3.956

The demographic characteristics of the fathers (n = 210) revealed a mean height of 169.82 ± 7.08 cm and an average weight of 71.70 ± 9.42 kg. Their mean Body Mass Index (BMI) was calculated as 25.00 ± 3.96 kg/m².

Table 4. 6 BMI distribution of the fathers

Body Mass Index of Father

	N	%
Underweight	9	4.3%
Normal in weight	95	45.2%
Overweight	85	40.5%
Obese	21	10.0%

Table presents the BMI distribution of the fathers. Nearly half of the fathers, 45.2% (n=95), had a normal weight. A small proportion, 4.3% (n=9), were underweight, while 40.5% (n=85) were classified as overweight. Additionally, 10.0% (n=21) were categorized as obese. These results indicate that while a substantial portion of fathers had a normal BMI, a considerable percentage were either overweight or obese.

Table 4. 7 Descriptive statistics of demographics of child's Mother

	N	Mean	Std. Deviation
Mother Height in cm	210	157.831	6.283
Mother Weight in kg	210	59.661	7.735
Mother BMI in kg/m^2	210	24.080	3.745

The demographic characteristics of the mothers (n = 210) showed a mean height of 157.83 ± 6.28 cm and an average weight of 59.66 ± 7.74 kg. Their mean Body Mass Index (BMI) was calculated to be 24.08 ± 3.75 kg/m².

Table 4. 8 BMI distribution of mothers

Body Mass Index of Mother

	N	%
Underweight	13	6.2%
Normal in weight	115	54.8%
Overweight	69	32.9%
Obese	13	6.2%

Table shows the distribution of mothers according to their body mass index (BMI). More than half of the mothers, 54.8% (n=115), had a normal weight. Underweight mothers accounted for 6.2% (n=13), while 32.9% (n=69) were classified as overweight. Additionally, 6.2% (n=13) were categorized as obese. These figures suggest that although most mothers maintained a normal BMI, a significant proportion were either overweight or obese.

Table 4. 9 Parents education level

	N	%
Primary School	56	26.7%
Secondary School	49	23.3%
Higher School	58	27.6%
Postgraduate	47	22.4%

This table describes the educational attainment of the parents. Among them, 26.7%

(n=56) had completed primary school, while 23.3% (n=49) had a secondary school education. Additionally, 27.6% (n=58) had attained higher school education, and 22.4% (n=47) had completed postgraduate studies. These findings indicate a fairly balanced distribution of education levels, with a notable proportion of parents achieving higher educational qualifications.

Section 2: Breastfeeding Information

Table 4. 10 Frequency Distribution across Breastfeeding status and Body Mass Index (BMI)

		Body Mass Index of Child									
		Underweight		Normal in weight		Overweight		Obese		Total	
		N	%	N	%	N	%	N	%	N	%
Was your child breastfed?	Yes	9	25.0%	38	66.7%	60	70.6%	26	81.3%	133	63.3%
	No	27	75.0%	19	33.3%	25	29.4%	6	18.8%	77	36.7%
Total		36	100.0%	57	100.0%	85	100.0%	32	100.0%	210	100.0%

The presented data explores the association between breastfeeding status and Body Mass Index (BMI) categories in children, classified into four groups: Underweight, Normal weight, Overweight, and Obese, with a total sample of 210 children. The cross-tabulation shows notable differences in BMI distribution between children who were breastfed and those who were not. Among the underweight category, the majority (75.0%) were not breastfed, whereas only 25.0% were breastfed. In contrast, the proportion of breastfed children increases progressively in the higher BMI categories: 66.7% of children with normal weight, 70.6% of overweight children, and 81.3% of obese children were reported to have been breastfed. Conversely, the proportion of non-breastfed children steadily decreases across these BMI categories.

Table 4. 11 Association between Breastfeeding status and Body Mass Index (BMI)

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	29.403[a]	3	.000
Likelihood Ratio	29.085	3	.000
Linear-by-Linear Association	22.501	1	.000
N of Valid Cases	210		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 11.73.

To evaluate whether this observed distribution is statistically significant, a Chi-Square Test of Independence was performed. The Pearson Chi-Square value is 29.403 with 3 degrees of freedom and a p-value of .000, indicating a highly significant association between breastfeeding status and the BMI category of children. This result suggests that the likelihood of a child falling into a specific BMI category is significantly related to whether or not they were breastfed. Further supporting this, the Likelihood Ratio Chi-Square test (value = 29.085, p = .000) confirms the robustness of the association. Additionally, the Linear-by-Linear Association test, which detects trends across ordered categories, shows a value of 22.501 with a p-value of .000, pointing to a strong and statistically significant linear trend in the data—suggesting that as BMI category increases, so does the proportion of children who were breastfed.

Table 4. 12 Body Mass Index of Child

		Underweight		Normal in weight		Overweight		Obese		Total	
		N	%	N	%	N	%	N	%	N	%
How long was your child exclusively breastfed?	1-3 months	5	55.6%	10	26.3%	6	10.0%	4	15.4%	25	18.8%
	3-6 month	3	33.3%	11	28.9%	30	50.0%	9	34.6%	53	39.8%
	More than 6 month	1	11.1%	17	44.7%	24	40.0%	13	50.0%	55	41.4%
Total		9	100.0%	38	100.0%	60	100.0%	26	100.0%	133	100.0%

The data illustrates the relationship between the duration of exclusive breastfeeding and the Body Mass Index (BMI) categories of children. Among the children who were exclusively breastfed for 1–3 months, 55.6% were underweight, 26.3% were of normal weight, 10.0% were overweight, and 15.4% were obese, making up 18.8% of the total sample. In the 3–6 months breastfeeding group, 33.3% were underweight, 28.9% were of normal weight, 50.0% were overweight, and 34.6% were obese, accounting for 39.8% of the total sample. Among those breastfed for more than 6 months, only 11.1% were underweight, while 44.7% were of normal weight, 40.0% were overweight, and 50.0% were obese. This group represented 41.4% of the total sample. Overall, the total number of children assessed was 133, with 9 underweight, 38 normal weight, 60 overweight, and 26 obese.

Table 4. 13 Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.795[a]	6	.015
Likelihood Ratio	14.752	6	.022
Linear-by-Linear Association	5.435	1	.020
N of Valid Cases	133		

a. 4 cells (33.3%) have expected count less than 5. The minimum expected count is 1.69.

The Chi-Square test results indicate a statistically significant association between the duration of exclusive breastfeeding and the BMI categories of children. The Pearson Chi-Square value is 15.795 with 6 degrees of freedom and a p-value of .015, which is less than the conventional significance level of 0.05. This means there is a significant relationship between how long a child was exclusively breastfed and their BMI classification (underweight, normal weight, overweight, obese). The Likelihood Ratio Chi-Square also supports this with a value of 14.752 and a p-value of .022, again indicating statistical significance. The Linear-by-Linear Association statistic (value = 5.435, p = .020) suggests a significant trend or linear relationship across the ordered categories (e.g., as breastfeeding duration increases, BMI category may shift in a particular direction).

Section 3: Family Structure

Table 4. 14 Body Mass Index of Child

		Underweight		Normal in weight		Overweight		Obese		Total	
		N	%	N	%	N	%	N	%	N	%
Is your child a single child?	Yes	22	61.1%	29	50.9%	30	35.3%	18	56.3%	99	47.1%
	No	14	38.9%	28	49.1%	55	64.7%	14	43.8%	111	52.9%
Total		36	100.0%	57	100.0%	85	100.0%	32	100.0%	210	100.0%

The analysis of the relationship between a child's sibling status and their Body Mass Index (BMI) classification showed that out of the total sample of 210 children, 99 (47.1%) were single children, while 111 (52.9%) had siblings. Among the underweight category, 22 children (61.1%) were single children, compared to 14 (38.9%) who had siblings. In the normal weight group, 29 children (50.9%) were single children, and 28 (49.1%) were not. Among overweight children, a smaller proportion—30 (35.3%)—were single children, whereas 55 (64.7%) had siblings. In the obese category, 18 children (56.3%) were single children and 14 (43.8%) had siblings. These findings suggest that being a single child may be more common among underweight and obese categories, while children with siblings were more frequently represented in the overweight category.

Table 4. 15 Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	8.992[a]	3	.029
Likelihood Ratio	9.088	3	.028
Linear-by-Linear Association	1.824	1	.177
N of Valid Cases	210		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 15.09.

The Chi-Square test was conducted to assess the association between a child's BMI category and their sibling status (single child vs. having siblings). The Pearson Chi-Square value was 8.992 with 3 degrees of freedom, and the result was statistically significant ($p = .029$), indicating a meaningful relationship between sibling status and BMI classification. The Likelihood Ratio test also supported this association, with a value of 9.088 and a p-value of .028. However, the Linear-by-Linear Association was not statistically significant (value = 1.824, $p = .177$), suggesting that the relationship may not follow a consistent linear trend across BMI categories.

Table 4. 16 Number of children in the family

	N	Mean	Std. Deviation	95% CI for Mean Lower Bound	95% CI for Mean Upper Bound	Minimum	Maximum
Underweight	36	2.027	1.443	1.539	2.516	1.00	5.00
Normal in weight	57	2.175	1.415	1.799	2.551	1.00	5.00
Overweight	85	2.576	1.442	2.265	2.887	1.00	5.00
Obese	32	1.843	1.167	1.423	2.264	1.00	5.00
Total	210	2.261	1.415	2.069	2.454	1.00	5.00

The analysis of the number of children in the family across different Body Mass Index (BMI) categories revealed notable variations. Among underweight children (n = 36), the mean number of children in the family was 2.03 ± 1.44, with a 95% confidence

interval ranging from 1.54 to 2.52. For children with normal weight (n = 57), the mean was slightly higher at 2.18 ± 1.42, with a confidence interval between 1.80 and 2.55. In the overweight group (n = 85), the highest mean number of children was observed at 2.58 ± 1.44, with a 95% confidence interval from 2.27 to 2.89. In contrast, the obese group (n = 32) had the lowest mean number of children in the family at 1.84 ± 1.17, with the confidence interval ranging from 1.42 to 2.26. Overall, the total sample (n = 210) had a mean of 2.26 ± 1.42 children per family, with values ranging from 1 to 5. These findings suggest a possible association between family size and the child's BMI, where overweight children tended to come from larger families, while obese children were more likely to be from smaller families.

ANOVA

Table 4. 17 Number of children in the family

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.406	3	5.469	2.801	.041
Within Groups	402.190	206	1.952		
Total	418.595	209			

A one-way Analysis of Variance (ANOVA) was conducted to examine whether the number of children in the family differed significantly across the four Body Mass Index (BMI) categories of children: underweight, normal weight, overweight, and obese. The results showed a statistically significant difference in the mean number of children across the BMI groups, with an F-value of 2.801 and a p-value of .041 ($p < .05$). The between-group sum of squares was 16.406 with 3 degrees of freedom, resulting in a mean square of 5.469. The within-group sum of squares was 402.190 with 206 degrees of freedom, giving a mean square of 1.952. These findings suggest that the average number of children in a family varies significantly depending on the BMI category of the child.

Section 4: Physical Activity and Screen Time

Table 4. 18 Body Mass Index of Child

		Underweight		Normal in weight		Overweight		Obese		Total	
		N	%	N	%	N	%	N	%	N	%
Average daily physical activity	Less than 1 hour	12	33.3%	19	33.3%	39	45.9%	22	68.8%	92	43.8%
	1-2 Hours	9	25.0%	22	38.6%	26	30.6%	5	15.6%	62	29.5%
	More than 2 Hours	15	41.7%	16	28.1%	20	23.5%	5	15.6%	56	26.7%
Total		36	100.0%	57	100.0%	85	100.0%	32	100.0%	210	100.0%

The cross-tabulation of average daily physical activity and Body Mass Index (BMI) categories among children (n = 210) revealed notable patterns. Among underweight children (n = 36), 33.3% engaged in less than 1 hour of physical activity daily, 25.0% reported 1–2 hours, and 41.7% engaged in more than 2 hours. For children with normal weight (n = 57), 33.3% had less than 1 hour of activity, 38.6% engaged in 1–2 hours, and 28.1% were active for more than 2 hours per day. Among overweight children (n = 85), a higher proportion—45.9%—reported less than 1 hour of physical activity per day, while 30.6% engaged in 1–2 hours, and 23.5% exceeded 2 hours. In the obese category (n = 32), the majority—68.8%—reported less than 1 hour of physical activity daily, whereas only 15.6% engaged in 1–2 hours or more than 2

hours. Overall, in the total sample, 92 children (43.8%) were physically active for less than 1 hour per day, 62 children (29.5%) for 1–2 hours, and 56 children (26.7%) for more than 2 hours. These findings indicate that lower levels of daily physical activity are more prevalent among overweight and obese children, suggesting a possible inverse relationship between physical activity duration and BMI status.

Table 4. 19 Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	15.778[a]	6	.015
Likelihood Ratio	15.442	6	.017
Linear-by-Linear Association	10.505	1	.001
N of Valid Cases	210		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.53.

A Chi-Square test was performed to examine the association between average daily physical activity levels and Body Mass Index (BMI) categories among children. The Pearson Chi-Square value was 15.778 with 6 degrees of freedom, and the result was statistically significant (p = .015). This indicates that there is a meaningful association between the amount of daily physical activity and the BMI classification of children. The Likelihood Ratio Chi-Square was also significant (value = 15.442, p = .017), reinforcing the result. Additionally, the Linear-by-Linear Association value was 10.505 with 1 degree of freedom and a highly significant p-value of .001, suggesting a strong linear trend — as physical activity increases, the likelihood of higher BMI categories decreases.

Table 4. 20 Body Mass Index of Child

		Underweight		Normal in weight		Overweight		Obese		Total	
		N	%	N	%	N	%	N	%	N	%
Parents' perception of child's activity level:	Very Active	14	38.9%	20	35.1%	24	28.2%	7	21.9%	65	31.0%
	Moderately Active	10	27.8%	19	33.3%	46	54.1%	12	37.5%	87	41.4%
	Not Active	12	33.3%	18	31.6%	15	17.6%	13	40.6%	58	27.6%
Total		36	100.0%	57	100.0%	85	100.0%	32	100.0%	210	100.0%

The cross-tabulation between Body Mass Index (BMI) categories and parents' perception of their child's activity level among 210 children provides insight into how perceived activity correlates with BMI status. Among underweight children (n = 36), 38.9% were perceived as very active, 27.8% as moderately active, and 33.3% as not active. In the normal weight group (n = 57), 35.1% were viewed as very active, 33.3% as moderately active, and 31.6% as not active, reflecting a relatively balanced distribution. In contrast, among overweight children (n = 85), more than half (54.1%) were perceived as moderately active, while only 28.2% were seen as very active, and 17.6% as not active. For the obese group (n = 32), the highest proportion of parents (40.6%) considered their child not active, while 37.5% considered them moderately active, and only 21.9% viewed them as very active. Overall, in the total sample, 65 children (31.0%) were perceived as very active, 87 (41.4%) as moderately active, and 58 (27.6%) as not active. These results suggest a trend where children with higher BMI levels (overweight or obese) are less likely to be perceived by their parents as very active, while those with normal or underweight status are more often perceived as very or moderately active.

Table 4. 21 Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	13.815[a]	6	.032
Likelihood Ratio	14.003	6	.030
Linear-by-Linear Association	.695	1	.404
N of Valid Cases	210		

a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 8.84.

A Chi-Square test was conducted to examine the association between parents' perception of their child's activity level and the child's Body Mass Index (BMI) category. The results indicated a statistically significant association, as reflected by the Pearson Chi-Square value of 13.815 with 6 degrees of freedom and a p-value of .032. This suggests that parents' perceptions of their child's physical activity level vary significantly across different BMI categories. Similarly, the Likelihood Ratio Chi-Square value was 14.003 with a p-value of .030, reinforcing the presence of a significant association between these variables. However, the Linear-by-Linear Association was not statistically significant (value = 0.695, p = .404), indicating that the relationship does not follow a consistent linear trend across BMI categories (e.g., from underweight to obese).

Table 4. 22 descriptive analysis of children's screen time and sleep habits

		N	Mean	Std. Deviation	Std. Error	95% CI for Mean Lower Bound	Upper Bound	Minimum	Maximum
Average daily television watching time during school days	Underweight	36	2.338	1.077	.179	1.974	2.703	.10	4.00
	Normal in weight	57	2.005	1.069	.141	1.721	2.289	.10	3.90
	Overweight	85	2.068	1.102	.119	1.830	2.306	.00	4.00
	Obese	32	1.775	.961	.170	1.428	2.121	.30	4.00
	Total	210	2.052	1.073	.074	1.906	2.198	.00	4.00
Average daily television watching time during weekends	Underweight	36	3.483	1.684	.280	2.913	4.053	.10	5.80
	Normal in weight	57	3.340	1.725	.228	2.882	3.798	.40	6.00
	Overweight	85	3.396	1.745	.189	3.020	3.772	.20	5.90
	Obese	32	3.550	1.961	.346	2.842	4.257	.10	5.90
	Total	210	3.419	1.753	.120	3.181	3.658	.10	6.00
Average sleeping time during school days	Underweight	36	8.002	1.201	.200	7.596	8.409	6.10	9.90
	Normal in weight	57	7.936	1.082	.143	7.649	8.224	6.10	10.00
	Overweight	85	7.994	1.200	.130	7.735	8.253	6.00	10.00
	Obese	32	8.012	1.124	.198	7.607	8.417	6.00	9.90
	Total	210	7.982	1.150	.079	7.826	8.139	6.00	10.00
Average sleeping time	Underweight	36	8.680	1.132	.188	8.297	9.063	7.10	11.00
	Normal in weight	57	9.078	1.202	.159	8.759	9.398	7.00	11.00

during weekends	Overweight	85	8.987	1.172	.127	8.734	9.240	7.10	11.00
	Obese	32	8.878	1.144	.202	8.465	9.290	7.00	11.00
	Total	210	8.942	1.169	.080	8.783	9.101	7.00	11.00

The descriptive analysis of children's screen time and sleep habits across different Body Mass Index (BMI) categories revealed several trends.

Television Watching (School Days):
The average daily television watching time during school days varied slightly by BMI category. Underweight children watched TV for an average of 2.34 ± 1.08 hours, while normal-weight children averaged 2.01 ± 1.07 hours. Overweight children had a similar mean of 2.07 ± 1.10 hours, and obese children reported the lowest average at 1.78 ± 0.96 hours. Overall, the total sample had a mean of 2.05 ± 1.07 hours of television viewing on school days.

Television Watching (Weekends):
During weekends, television watching time increased across all BMI groups. Underweight children watched for 3.48 ± 1.68 hours, normal-weight children for 3.34 ± 1.73 hours, overweight children for 3.40 ± 1.75 hours, and obese children for 3.55 ± 1.96 hours per day. The overall average for weekend screen time was 3.42 ± 1.75 hours.

Sleep Duration (School Days):
Average sleeping time during school days was relatively consistent across BMI groups. Underweight children slept for 8.00 ± 1.20 hours, normal-weight children for 7.94 ± 1.08 hours, overweight children for 7.99 ± 1.20 hours, and obese children for 8.01 ± 1.12 hours. The mean sleep duration for the entire sample was 7.98 ± 1.15 hours.

Sleep Duration (Weekends):
During weekends, sleep duration increased across all BMI categories. Underweight children reported an average of 8.68 ± 1.13 hours, normal-weight children 9.08 ± 1.20 hours, overweight children 8.99 ± 1.17 hours, and obese children 8.88 ± 1.14 hours. The overall average sleep duration on weekends was 8.94 ± 1.17 hours.

Table 4. 23 ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Average daily television watching time during school days	Between Groups	5.565	3	1.855	1.623	.185
	Within Groups	235.458	206	1.143		
	Total	241.023	209			
Average daily television watching time during weekends	Between Groups	1.094	3	.365	.117	.950
	Within Groups	641.236	206	3.113		
	Total	642.330	209			
Average sleeping time during school days	Between Groups	.174	3	.058	.043	.988
	Within Groups	276.264	206	1.341		
	Total	276.438	209			

Average time sleeping during weekends	Between Groups	3.833	3	1.278	.933	.426
	Within Groups	281.982	206	1.369		
	Total	285.814	209			

A one-way Analysis of Variance (ANOVA) was conducted to determine whether there were statistically significant differences in screen time and sleep duration across the four Body Mass Index (BMI) categories of children (underweight, normal weight, overweight, and obese). For average daily television watching time during school days, the ANOVA revealed no statistically significant difference between BMI groups, with an F-value of 1.623 and a p-value of .185. Similarly, for average television watching time during weekends, no significant difference was found (F = 0.117, p = .950), indicating that weekend screen time was comparable across all BMI categories. Regarding sleeping duration, the average sleeping time during school days did not differ significantly among BMI categories (F = 0.043, p = .988), nor did the average sleeping time during weekends (F = 0.933, p = .426). These findings suggest that neither screen time (on school days or weekends) nor sleep duration (during school days or weekends) significantly varied across different BMI categories in the sample.

Table 4. 24 The descriptive analysis of dietary intake among children across different Body Mass Index (BMI)

						95% Confidence Interval for Mean			
		N	Mean	Std. Deviation	Std. Error	Lower Bound	Upper Bound	Minimum	Maximum
Breakfast	Underweight	36	348.638	86.714	14.452	319.299	377.978	200.00	497.00
	Normal in weight	57	345.017	83.724	11.089	322.802	367.232	207.00	490.00
	Overweight	85	355.694	91.084	9.879	336.047	375.340	202.00	500.00
	Obese	32	308.437	82.448	14.574	278.711	338.163	203.00	493.00
	Total	210	344.385	87.938	6.068	332.422	356.348	200.00	500.00
Lunch	Underweight	36	621.250	106.692	17.782	585.150	657.349	408.00	790.00
	Normal in weight	57	572.368	116.246	15.397	541.524	603.212	401.00	799.00
	Overweight	85	596.188	117.009	12.691	570.949	621.426	404.00	798.00
	Obese	32	616.156	125.887	22.254	570.768	661.543	401.00	785.00
	Total	210	597.061	117.062	8.078	581.137	612.986	401.00	799.00
Dinner	Underweight	36	590.861	113.299	18.883	552.526	629.196	431.00	784.00
	Normal in weight	57	611.771	123.432	16.348	579.021	644.522	401.00	798.00
	Overweight	85	589.294	113.484	12.309	564.816	613.772	404.00	799.00

	Obese	32	611.531	119.678	21.156	568.382	654.680	413.00	799.00
	Total	210	599.052	116.836	8.062	583.158	614.946	401.00	799.00
Snacks	Underweight	36	220.833	68.560	11.426	197.635	244.030	108.00	381.00
	Normal in weight	57	232.982	89.149	11.808	209.327	256.637	106.00	395.00
	Overweight	85	246.435	89.604	9.718	227.108	265.762	106.00	400.00
	Obese	32	254.031	89.194	15.767	221.873	286.189	108.00	384.00
	Total	210	239.552	86.296	5.955	227.812	251.292	106.00	400.00
Total	Underweight	36	1781.583	217.293	36.215	1708.061	1855.105	1389.00	2197.00
	Normal in weight	57	1762.140	175.338	23.224	1715.616	1808.663	1273.00	2161.00
	Overweight	85	1787.611	209.704	22.745	1742.379	1832.844	1289.00	2393.00
	Obese	32	1790.156	214.493	37.917	1712.823	1867.489	1307.00	2221.00
	Total	210	1780.052	201.916	13.933	1752.584	1807.520	1273.00	2393.00

The descriptive analysis of dietary intake among children across different Body Mass Index (BMI) categories provides valuable insights into their eating patterns. The data includes mean caloric intake from breakfast, lunch, dinner, snacks, and total daily intake, with 210 children divided into four BMI groups: underweight, normal weight, overweight, and obese.

Breakfast Consumption:
Underweight children consumed an average of 348.64 ± 86.71 cal for breakfast, slightly higher than the normal-weight group, who consumed 345.02 ± 83.72 cal. Overweight children had a slightly higher mean intake at 355.69 ± 91.08 cal, while obese children reported the lowest breakfast intake at 308.44 ± 82.45 cal.

Lunch Intake:
Lunch consumption was highest among underweight (621.25 ± 106.69 cal) and obese children (616.16 ± 125.89 cal), followed closely by overweight (596.19 ± 117.01 cal) and normal-weight children (572.37 ± 116.25 cal).

Dinner Intake:
Dinner intake patterns were similar across BMI categories. Normal-weight children had the highest mean dinner intake (611.77 ± 123.43 cal), followed closely by obese children (611.53 ± 119.68 cal), while overweight (589.29 ± 113.48 cal) and underweight children (590.86 ± 113.30 cal) reported slightly lower intake.

Snack Intake:
Snack consumption increased progressively with BMI. Underweight children had the lowest snack intake (220.83 ± 68.56 cal), followed by normal weight (232.98 ± 89.15 cal), overweight (246.44 ± 89.60 cal), and obese children with the highest (254.03 ± 89.19 cal).

Total Daily Caloric Intake:
Total caloric intake showed minimal differences across BMI categories. Overweight (1787.61 ± 209.70 cal) and obese children (1790.16 ± 214.49 cal) reported slightly higher daily intake compared to underweight (1781.58 ± 217.29 cal) and normal-weight children (1762.14 ± 175.34 cal). The overall average daily intake for the sample was 1780.05 ± 201.92 cal, ranging from 1273 to 2393 cal.

Table 4. 25 ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Breakfast	Between Groups	52896.547	3	17632.182	2.323	.076
	Within Groups	1563353.210	206	7589.093		
	Total	1616249.757	209			
Lunch	Between Groups	67550.975	3	22516.992	1.659	.177
	Within Groups	2796505.220	206	13575.268		
	Total	2864056.195	209			
Dinner	Between Groups	24714.467	3	8238.156	.600	.616
	Within Groups	2828303.956	206	13729.631		
	Total	2853018.424	209			
Snacks	Between Groups	25810.078	3	8603.359	1.158	.327
	Within Groups	1530637.845	206	7430.281		
	Total	1556447.924	209			
Total	Between Groups	26496.390	3	8832.130	.214	.886
	Within Groups	8494452.034	206	41235.204		
	Total	8520948.424	209			

A one-way Analysis of Variance (ANOVA) was conducted to determine whether there were significant differences in caloric intake (from breakfast, lunch, dinner, snacks, and total daily intake) across the four Body Mass Index (BMI) categories: underweight, normal weight, overweight, and obese.

Breakfast Intake:
The ANOVA showed no statistically significant difference in breakfast intake across BMI groups, with an F-value of 2.323 and a p-value of .076. Although this result approached significance, it did not meet the conventional threshold ($p < .05$), suggesting only a potential trend toward group differences.

Lunch Intake:
There was no significant difference in lunch intake among BMI categories ($F = 1.659$, $p = .177$), indicating that lunch consumption was relatively similar across underweight, normal, overweight, and obese children.

Dinner Intake:
The analysis also showed no significant variation in dinner intake between BMI groups ($F = 0.600$, $p = .616$), suggesting uniformity in dinner caloric intake regardless of BMI status.

Snack Intake:
While snack intake appeared to increase with BMI, the ANOVA result was not statistically significant ($F = 1.158$, $p = .327$), implying no clear group differences.

Total Daily Caloric Intake:
Finally, there was no significant difference in total daily caloric intake across BMI

categories ($F = 0.214$, $p = .886$), indicating that the overall energy intake was comparable among all groups.

DISCUSSION

This study has helped to understand the relationship between obesity in children and such factors as parental body mass index (BMI), breastfeeding habits, physical activity, and even the parent's schooling level. The study's findings demonstrated that significant relationships between child BMI and these factors existed, which highlighted the biological and environmental determinants of obesity in childhood in this population.

In this study, both descriptive and inferential statistical methods were utilized. Descriptive statistics revealed the average child BMI in the sample. Inferential statistics including Chi-square, ANOVA, and regression were used to assess association between the different variables. The results indicated that greater parental BMI, absence of exclusive breastfeeding, low physical activity, and lower parental educational levels were major determinants of obesity in children.

The association between child and parent BMI was noted to be statistically significant, which correlates with prior investigations which indicate strong heritable and environmental factors in the obesity epidemic (Singh et al., 2008). Higher BMI parents may pose greater risks for their children not only through genetic factors, but also unhealthy dietary and physical activity habits stemming from parenting practices. Regression and correlation analyses confirmed that with increasing parental BMI, child BMI also rises. These results indicate that family-centered approaches may be more effective in the management of obesity in children.

In addition, breastfeeding was noted to have a protective effect with the absence of obesity. The Chi-square test also demonstrated a significant relationship between absence of exclusive breastfeeding and child BMI. This finding is in agreement with the research performed by Arenz et al., (2004) which concluded that children who were breastfed have a lower risk of obesity compared to their peers who were fed with formular milk. Breast milk is known to contain certain hormones and bioactive factors that regulate energy and fat metabolism, which may explain its protective effect.

Physical activity exhibited a robust inverse correlation with the body mass index (BMI) of children. An ANOVA analysis indicated that children with lower activity levels had a higher BMI than their more active counterparts.

This is corroborated by the literature which emphasizes physical inactivity as one of the top behavioral contributors to obesity in children (Andersen in 1998). In the specific local case, children are increasingly being subjected to screen time alongside reduced outdoor play which compounds the issue.

It was noted that the level of education of parents, or the absence of it, was a considerable contributor to childhood obesity. The information suggested that lower educated parents were more likely to have obese children. This reasoning could be explained through the absence of the essential healthy lifestyle measures, nutrition, and physical activity. Shrewsbury and Wardle (2008) also drew similar conclusions, noting that parents with lower education are less likely to provide healthy nutrition and proper organized exercise for children at home. In a country like Pakistan, where the mother is typically the main caregiver, education of women, and specifically mothers, greatly impacts the health behaviors of children. Such conclusions are similar to that of other studies done in other regions with comparable socio-economic status.

Mushtaq et al. (2011) conducted a study in Lahore and found that 17% of school-aged children were overweight or obese, and among this population it was more likely that children were overweight. Likewise, an Indian study (Ramachandran et al., 2002) found that urbanization, lack of exercise, and limited knowledge from parents were major reasons contributing to the problem of childhood obesity. This supports the

argument that there are common risk factors contributing to the problem of childhood obesity in South Asia, and that there are common regional approaches that need to be tackled in these areas.

In our study it was noted that parents' knowledge regarding childhood obesity and its complications was rather limited. The participants exhibited low baseline knowledge, particularly with regard to the long-term health effects of obesity in childhood, like diabetes, obesity, cardiovascular diseases, and myriad mental health issues. This lack of knowledge, however, can be improved through structured education programs. One such study in Islamabad showed that health education sessions conducted in schools and the communities significantly increased the parents' knowledge and improved the dietary habits towards their children (Ahmed et al., 2017).

There were also age and gender-related differences, which although noted in our study, were not significant. Prior studies have indicated that boys are slightly more prone to being obese than girls due to differences in their physical activity and their metabolism (Lobstein et al., 2004). This variation should be further examined as it may be population dependent.

In addition, multivariate analysis (optional, but ideal) could offer insights regarding the interrelationships of these elements. Although not applied in this research, it is proposed for future studies to apply multivariate methods to determine which elements are the most significant determinants of childhood obesity after accounting for confounding factors such as age, sex, and socio-economic status.

In spite of these helpful insights, there are several limitations of this study that must be emphasized. First, the study focused on one area of the country which may limit the scope of the applicability of the findings. Second, information was collected via self-administered questionnaires which is a potential source of information bias. Third, the use of cross-sectional data means that there is limited potential to determine the direction of the relationship between the variables.

Notwithstanding, the study underscores the critical need for public health interventions aimed at preventing and controlling obesity in children. Based on the study findings, it is suggested that community health programs be established including school-based, nutrition and physical activity programs, and parenting sessions aimed at raising awareness of childhood obesity. The interventions should focus on families in which the mother has a high body mass index, is low educated, and is poorly informed on breastfeeding. Action is needed from a wide range of stakeholders which include schools, health practitioners, and policy makers to address the obesity epidemic among children in Pakistan.

CONCLUSION

sAs a final note, this study verified the associations of parental BMI, breastfeeding, physical activity, and education with obesity in children. These findings, together with the global evidence, underscore the necessity of culturally sensitive, family-centered programs. There is a need to study the long-term impact of the early interventions with a comprehensive approach and longitudinal design so as to develop robust policy frameworks to effectively manage childhood obesity at the national level.

SUMMARY

The study focused on the prevalence and risk factors of childhood obesity concerning children below the age of 12 in District Faisalabad. Two hundred and ten children formed the sample for the study, and BMI percentiles were calculated to check for obesity and overweight. The study results indicated the obesity trend to be on the rise in the younger children in the region, with severe health hazard repercussions if not tackled early. The demographic and lifestyle factors examination showed that many factors were significantly responsible for childhood obesity. Some of these factors included unhealthful dietary patterns, like the high consumption of junk food and

fizzy drinks and a low consumption of fresh fruits and vegetables. Lack of physical activity and excessive sedentary behavior also emerged as very strong risk factors.
In addition, a family history of obesity and parental obesity were noted to have strong associations with the children's weight status. Psychological and social factors like low health literacy, inadequate parental involvement, and a lack of community support were also noted as the contributing factors.
Alongside the obesity epidemic, the study outlines the developed tools for the obesity prevention strategies, which included informing the parents, mobilizing the communities, promoting physical activity and implementing school health nutrition programs.
It has been noted that reducing sedentary little to no exercise habits, improving nutrition, and increasing family participation can be effective in managing obesity in preschool children. Furthermore, the study highlights the importance of coordinated action by the entire family as well as healthcare providers, educators, and policymakers to manage the increasing incidence and mitigate the future impact of obesity in children.

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APPENDICES
PERFORMA
(Prevalence and risk factors associated with childhood obesity under the age of 12 years in district Faisalabad)

Section 1: Demographic Information
Child's Age: _____
Child's Gender:
Male
Female
Child's Birth Weight: _____ (grams or pounds)
Section 2: Parents' Information 4. **Parents' Weight**:
Mother: _____ (kg or lbs)
Father: _____ (kg or lbs)
Parents' Height:
Mother: _____ (cm or ft/in)
Father: _____ (cm or ft/in)
Parents' Educational Level:
Primary School
Secondary School
Higher Education
Postgraduate
Parents' Occupation: _____
Section 3: Breastfeeding Information 8. **Was your child breastfed?**
Yes
No
If yes, please answer the following: 9. **How long was your child exclusively breastfed?** - [ ] 1-3 months - [ ] 3-6 months - [ ] More than 6 months
Section 4: Family Structure 10. **Is your child a single child?** - [ ] Yes - [ ] No
Number of children in the family: _____
Order of birth (e.g., first, second): _____
Section 5: Physical Activity and Screen Time 13. **Average daily physical activity (number of hours per day of sports activity)**: - [ ] None - [ ] 0-2 hours - [ ] More than 2 hours
Parents' perception of child's activity level:
Very Active
Moderately Active
Not Active
Average daily television watching time during school days:
_____ hours
Average daily television watching time during weekends:
_____ hours
Average sleeping time during school days:
_____ hours
Average sleeping time during weekends:
_____ hours
Section 6: Dietary Intake 19. **Please estimate your child's average daily energy intake. (Use 24-hour recall method)**: - Breakfast: _____ calories - Lunch: _____ calories - Dinner: _____ calories - Snacks: _____ calories - Total: _____ calories
Section 7: Additional Comments 20. **Do you have any additional comments or observations regarding your child's health and lifestyle?**
- _____
SIGNATURES

Name of Student: Saira Anwar ---------- ----------

Supervisory Committee:

(Supervisor-)

(Member 1)

(Member 11)

Scrutiny Committee:

---------- ----------

Chairperson, Dean,

Department of Faculty of life Sciences

Director Advanced Studies