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Obesity Epidemiology and Public Health: Global Trends, Determinants, Inequalities, and Prevention Strategies

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Abstract:

Obesity is a widespread public health problem among populations around the world. Obesity rates among adults as well as children and adolescents have risen considerably. It is estimated that 940 million adults and 170 million children/adolescents (aged 5-19) worldwide are living with obesity in 2024. In low and middle income countries, obesity is on the rise and frequently coexists with malnutrition. Obesity can lead to many health complications, such as diabetes, cardiovascular disease, certain cancers, disability and premature death. To reduce obesity in populations, surveillance should be conducted, interventions should be implemented to prevent obesity in early life, healthy food environments should be established, physical activity should be promoted, equal access to primary healthcare should be ensured, and measures should be taken to address commercial/social factors. In countries such as Pakistan, targeted surveillance and inter-sectoral interventions must be implemented. Interventions aimed at preventing obesity must be applied at both individual and population levels.

Keywords: Obesity; Epidemiology; Public Health; Prevalence; Risk factors; Health inequalities

1. Introduction

Obesity is a major public health concern in the 21st century. Genetic factors, shifts in dietary intake, reduced physical activity, socioeconomic factors, growing urbanisation and changes in nutritional environments are driving up the prevalence of obesity. Consequently, this disease is placing considerable strain on health systems, productivity and social progress in populations. (Blüher, 2019; Hruby and Hu, 2015).
Epidemiological studies measure the prevalence of obesity using BMI. Obesity in adults refers to a BMI ≥30kg/m², while overweight refers to a BMI of ≥25kg/m². However, BMI is merely a screening tool. Measuring waist circumference can offer further insight into cardiometabolic risk.

Gaining an understanding of obesity within population groups enables public health to develop preventative strategies. This can involve targeting at-risk groups, improving healthcare delivery and reducing health inequalities. This review examines global and regional obesity trends, the burden of disease, social factors that contribute to obesity, at-risk groups, surveillance methods and evidence-based prevention strategies.

2. Global prevalence trends

Notable rises in obesity have been recorded over recent decades. Data covering 222 million people across 200 countries/regions reveals a substantial rise in adult obesity between 1990 and 2022. Since 1990, adult obesity has more than doubled, while obesity among children/adolescents has risen fourfold.

As of 2024, an estimated 940 million adults and 170 million children/adolescents (aged 5-19) are living with obesity worldwide. (WHO, 2026). Obesity is therefore now a public health concern not only in high income countries, but also among people at a range of socioeconomic development levels.

Between 1980 and 2013, the prevalence of overweight/obesity in adults and children rose substantially. (Ng et al, 2014). Likewise, research by Abarca-Gómez et al (2017) found a substantial rise in obesity among children/adolescents across various geographical regions. Clearly, this obesity epidemic has unfolded over many years, which makes ongoing surveillance important.

However, recent research has shown that obesity trends differ between countries. In many high income countries, obesity rates are stabilising. Conversely, obesity is rising rapidly in many developing countries. (NCD-RisC, 2026). Consequently, it is important to take into account the obesity trends and interventions in each individual country.

3. Regional disparities and the double burden of malnutrition

Obesity rates vary considerably between regions, countries and population groups. These differences may be driven by variations in economic development, urbanisation, food availability, transport and cultural dietary habits. In numerous countries experiencing rapid economic development, obesity rates are on the rise. Nevertheless, malnutrition and micronutrient deficiencies continue to occur.

As a result of global nutritional challenges, double burdens of malnutrition (both undernutrition and obesity) within populations are becoming increasingly common. (Popkin et al, 2020). This creates additional difficulties for developing countries, since public health strategies must be implemented to reduce undernutrition while at the same time lowering excessive energy intakes.

In Pakistan, an estimated 22.4% of adults and 6.9% of children and adolescents (aged 5-19) were living with obesity in 2022. (WHO, 2022). Obesity is clearly a significant problem in South Asian countries. These figures are modelled data derived from international sources. They are not taken directly from a single national study.

Rapid urbanisation, shifting dietary patterns, motor vehicle transportation, reduced physical activity at work and unequal access to healthy foods may all be contributing to a growing burden of obesity. To reduce obesity in these regions, public health strategies must take into account local dietary patterns, socioeconomic factors and the accessibility of preventative healthcare.

4. Key Contributing Factors and Risk Factors

Obesity results from complex interactions among biological, behavioural, environmental and socioeconomic factors. An individual's appetite regulation, energy metabolism, fat storage and susceptibility to obesity may be influenced by genetic factors. Nevertheless, genetic factors alone cannot account for the rising rates of obesity in populations.

Obesity can result from consuming energy-dense foods, sweetened drinks, refined carbohydrates and ultra-processed foods. Large food portions and aggressive food marketing may result in excessive energy intakes. In addition, traditional dietary patterns are shifting. Consumption of fibre-rich foods is declining.

A lack of physical activity can result in a positive energy balance. Sedentary jobs, more screen time, limited recreational opportunities and dependence on vehicles can lead to reduced physical activity.

Globally, commercial influences and local environmental factors play a key role in causing obesity (Swinburn et al, 2011). To reduce obesity within populations, food systems, commercial influences and the environment must be taken into account when choices are made.

Stress, poor sleep, certain medications, endocrine disorders and adverse early-life experiences can lead to weight gain. Thus, in an epidemiological context, many factors must be taken into account when examining obesity.

5. Health Effects and Burden of Disease

Obesity is linked to many chronic diseases. It can lead to premature death. Health complications include: type 2 diabetes mellitus, hypertension, dyslipidaemia, coronary artery disease, stroke, obstructive sleep apnoea, osteoarthritis and metabolically associated fatty liver disease.

Research on the global burden of disease shows that a high BMI causes a substantial burden of mortality and disease. Across 195 countries, the health effects of high BMI rose between 1980 and 2015. (GBD 2015 Obesity Collaborators, 2017).

A recent study by Zhou et al (2024) found that mortality and disability adjusted life years attributable to high BMIs rose substantially between 1990 and 2021. As a result, obesity is a major risk factor for the development of cardiovascular disease, diabetes and other chronic diseases in populations.

Obesity can also have a negative impact on mental and social health. The stigma attached to obesity can lead individuals to experience poorer mental health and a reduced quality of life. In children, obesity may lead to bullying, social isolation and difficulties at school. Obesity should therefore be regarded as a chronic illness in individuals, rather than blaming individuals for being obese.

Obesity imposes an economic burden on societies. It can lead to higher healthcare and medication costs, more hospital admissions, reduced workforce productivity and long term disability. If obesity is prevented among individuals, families and nations, significant benefits can be achieved.

6. Social Factors and Health Inequalities

Social and economic factors strongly affect the likelihood that individuals will develop obesity. Socioeconomic status, education level, occupation, housing circumstances, safety in local areas and food availability can all shape dietary habits and levels of physical activity.

People in low income groups may find it difficult to access healthy, fresh foods, safe places to walk, recreational facilities and preventative healthcare. At the same time, cheap high energy foods may be widely available in these areas, which means individuals in these groups are exposed to unhealthy food environments.

Social and structural factors are known to strongly influence health inequalities related to obesity (Williams et al, 2024). Inequalities in access to healthy food, differences in the characteristics of local communities and unequal access to healthcare can lead to large differences in individuals' risk of obesity and in their health

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outcomes.

A range of factors can influence the prevalence of obesity in populations. Gender, age, disability, location and culture can all affect prevalence. In some populations, females may find it difficult to take part in recreational physical activity because of safety concerns, domestic duties and a lack of public facilities.

To lessen health inequalities among populations, public health policies should strive to increase the availability of affordable healthy foods, recreational facilities, nutritional education and equal access to primary healthcare. Strategies should be created to support disadvantaged people without adding to the stigma and discrimination they face.

7. Childhood and adolescent obesity

Obesity in children is worrying because childhood obesity can lead to obesity in adulthood. As a result, obesity that develops at a young age can lead to complications earlier in life. Children with obesity may experience insulin resistance, hypertension, dyslipidaemia, fatty liver disease and mental health problems.

There has been a substantial global rise in obesity among children and adolescents. (Abarca-Gómez et al, 2017). Consequently, prevention strategies need to be implemented at an early stage. Factors that influence obesity in children and adolescents include the mother's health, whether they are breastfed, weaning, family dietary habits, dietary environments in schools and levels of physical activity.

Prevention strategies can be highly effective in schools. Offering nutritional education and healthy foods at school, limiting the marketing of unhealthy foods and promoting regular physical activity can encourage healthy lifestyles in children.

It is important to involve parents in prevention. Dietary habits, regular eating patterns and sedentary behaviour within families can affect children's development. Prevention strategies should be in place to support healthy development in children and should not lead to restrictive diets or weight-related stigma.

8. Surveillance

Accurate surveillance of obesity matters for understanding trends in populations and for assessing how effective public health interventions are. Data commonly gathered in epidemiological studies include prevalence, incidence, mortality, burden of disease and disability adjusted life years.

Standardised data ought to be gathered from studies based on populations. Reliable information on weight, height, waist circumference, age, gender and pertinent socioeconomic factors should be gathered. Nevertheless, data that are self reported can be imprecise. Where feasible, measuring anthropometric values directly would yield more precise data.

Longitudinal cohort studies may be conducted to examine changes in weight and to establish associations between risk factors and health outcomes. Cross-sectional studies may be employed to derive prevalence rates. Randomised control trials may be used to establish the effectiveness of particular prevention methods.

Pooling data from several population based studies enables international comparison of the data. (NCD-RisC, 2024). Differences among countries in sampling, the demographics of age groups, measurement methods and data availability may nonetheless lead to inaccuracies when making comparisons.

To generate more accurate data on obesity, national surveillance systems ought to be strengthened. Data quality should be enhanced so that up to date estimates can be produced. Additional research should be carried out in under-represented rural communities, disadvantaged groups and among people with limited access to healthcare services.

9. Public Health Interventions

Interventions aimed at preventing obesity within populations need to be multifactorial. Government, healthcare, education, the food industries and communities need to work together. While giving individuals advice on making lifestyle changes is important, lifestyle changes on their own may not be enough to counter the environmental and socioeconomic factors that lead to excessive weight gain.

WHO has published an acceleration plan to reduce obesity (WHO, 2022). Its goals are to strengthen political commitment, ensure policies are implemented effectively and enhance responses within health systems. The suggested measures involve establishing healthy food environments, enhancing nutrition during pregnancy and childhood, promoting physical activity, and offering services aimed at preventing and managing obesity.

In this setting, financial measures include taxing sugary drinks, subsidising healthy foods, and giving people incentives to adopt healthier diets. Rules on marketing unhealthy foods to children and better labelling to boost the nutritional content of foods can help people make healthy choices.

Since obesity, undernutrition and climate change are interconnected global problems, approaches that address multiple factors are needed. (Swinburn et al, 2019). Public health strategies ought to cover nutrition, food security, sustainable food production and environmental planning.

10. Healthcare systems and community initiatives

Primary healthcare is essential for identifying people at higher risk of complications. Measuring BMI, waist circumference, blood pressure, and glucose and lipid regulation makes it possible to detect early risk in people so they can be referred.

Healthcare professionals ought to offer evidence based dietary guidance, promote physical activity and manage any related metabolic problems. Where individuals are already obese, thorough and individualised management may be necessary. Based on clinical indicators, this could involve lifestyle changes, medication or bariatric surgery.

Community initiatives are able to increase public awareness of obesity among the general population. Programmes in workplaces, schools and walking areas, along with community based nutritional campaigns, can be introduced to support prevention.

In developing countries, priority should be given to affordable preventative measures and nutritional education suited to local cultures. Community health workers can help with early identification and education, especially in rural communities where access to specialist healthcare may be more limited.

11. Future research

Future research should look more closely at how the prevalence of obesity changes across different age groups, genders, socioeconomic groups and geographical locations. Longitudinal studies ought to be carried out to understand the long-term metabolic outcomes arising from early-life factors, shifts in dietary habits, insufficient physical activity and changes in environmental factors.

Advanced epidemiological methods, including geographic information systems, artificial intelligence, digital health and population data sets, could enable more effective surveillance and

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identification of at-risk groups.

Research should be carried out to understand the effectiveness and cost effectiveness of public health interventions across different socioeconomic groups. Countries with a double burden of malnutrition should be given particular consideration, since obesity prevention must be balanced against food security and micronutrient interventions.

Through collaboration between countries, standardised anthropometric measures, clear reporting and improvements in national health data systems, more reliable data will be obtainable in the future. This will make it possible to implement evidence-based interventions aimed at reducing obesity in a more equitable manner.

12. Conclusion

Obesity is on the rise in populations around the world. This rise results from the interaction of genetic susceptibility, changes in dietary habits, reduced physical activity, commercial factors and socioeconomic inequality. To reduce obesity, reliable surveillance must be maintained, and early-stage prevention, healthy food environments, regular physical activity and accessible primary healthcare should be put in place. Governments and public health institutions within countries must implement evidence-based interventions that target structural factors, helping individuals to make lifestyle changes. Special attention should be paid to developing countries that face a double burden of malnutrition. Strengthening research in this field, fostering collaboration between countries and ensuring equal access to preventative services will be essential to reducing disease caused by obesity and improving health in populations.

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