

Successful obesity management in a 115 kg 14-year-old child: a case report



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ABSTRACT

Background: Obesity is defined as being 20% or more above ideal body weight (IBW). Obesity is a major problem in children and adolescents, affecting 30% or more. It led to many changes and limited their ability to be physically active. Obese children often suffer from musculoskeletal pain, decreased physical function, and a sense of well-being. This might cause poor motor competency and also developmental alteration.

Case Presentation: A 14-year-old boy was referred to the Pediatric Department following complaints of excruciating pain in his lower leg. Under anthropometry examination, the patient was diagnosed with obesity with 115 kg at presentation. The patient was then treated and managed by changing their inactive lifestyle and increasing daily activities; also referred to a psychologist to help with psychological well-being and behavior change. Family and friends are involved during treatment. After four months of treatment, his body weight dropped from 115 kg to 98 kg to 73 kg in the next 2 years.

Conclusion: Success obesity management needs multidisciplinary involvement, which includes a pediatrician, nutritionist, psychologist, and also the patient's family

Keywords: Obesity, Intervention, Management, Pediatric.

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INTRODUCTION

Over the last five decades, child obesity has grown globally. Between 1975 and 2016, the worldwide age-standardized prevalence of obesity in children and adolescents aged 5-19 years grew from 0.7% (95% credible interval [CrI] 0.4-1.2) to 56% (4.8-6.5) for girls and from 0.9% (0.5-1.3) to 78% (6.7-9.1) for males. In 2019, the World Obesity Federation predicted that 206 million children and adolescents aged 5-19 years will be obese by 2025 and 254 million by 2030.¹ Of the 42 nations expected to have more than one million obese children by 2030, China ranks first, followed by India, the United States, Indonesia, and Brazil, with just seven of the top 42 countries being high-income countries.¹ Obesity is becoming a major problem in children and adolescents, affecting 30% or more. Obesity is no longer just an aesthetic issue; it is increasingly recognized as a disease that shortens people's lives. In addition to restricting exercise and interfering with daily activities, it has many health effects, including hyperinsulinemia, hypertension, diabetes, dyslipidemia, intertriginous

infections, sleep apnea, renal changes, hyperuricemia, psychological conditions, and diet out of tune.^{2,3}

Obesity is a gradual, evolving process that affects many children over time. This obesity pathway is leading to many changes in how teens exercise, many reducing or limiting their ability to be physically active. Obese children often suffer from musculoskeletal pain, decreased physical function, and a sense of well-being. As a result, physical fitness, strength and motor skills, and the ability to perform everyday activities such as walking and climbing stairs without discomfort all decrease. Consequently, movement problems prevent participation in regular physical activity and exercise during important developmental stages. Reducing or preventing obesity-related disability is critical to increasing exercise and physical activity participation.^{1,4,5}

The terms obesity and overweight are sometimes used interchangeably. Obesity is defined as being 20% or more above ideal body weight (IBW). If you weigh 20% more than you weigh, you are overweight. The most commonly used term to quantify

obesity is body mass index (BMI). The formula is (weight (kg)/height (m²)). Obesity is caused by an imbalance between energy intake and output, but the exact cause is unknown. Obesity can be classified as constitutional (intrinsic) or pathological (constitutional). An imbalance between energy intake and expenditure causes obesity. Endocrine obesity, genetic disorders, hypothalamic obesity, and monogenic obesity cause morbid obesity.^{2,6} The severity of the obesity determines therapy type and intensity, the child's age and developmental stage, the patient's and family's demands and preferences, the clinical competency and training of the clinician(s), and the healthcare system in which therapy is provided.^{3,7-9} Nutrition, exercise, psychological therapy, medication, and surgical treatments are all part of the treatment. It should be offered by appropriately competent pediatric health professionals who include non-stigmatizing child-focused and youth-focused communication in their practice. Obesity prevention is very important, and raising awareness can help.

Based on those mentioned above, this case study aims to report the successful management of obesity starting from the family as a support system.

CASE REPORT

This case study focuses on a 14-year-old boy, as seen in **Figure 1**. The patient was complaining of excruciating pain in his lower legs. The patient had difficulties performing daily activities and general clumsiness due to the pain. The patient was referred to our hospital after experiencing overall weakness for 10 days. From the anthropometry examination, he presented weighing 35 kg (5 years old), 80 kg (10 years old), and 115 kg, respectively. Based on his body mass index (BMI) of 47.9 kg/m² and weight for ideal body weight were above the 98th percentile.

The patient then implemented treatments and interventions for young people, which included changing inactive lifestyles and increasing daily activities such as dancing and doing household chores. Medication is given based on symptoms and comorbidities. A graduated calorie restriction diet 20% above his target weight above his optimal weight, cutting calories every 3 days by 10% (according to dietary tolerance) (**Figure 2-4**).

After four months of hospitalization, his body weight dropped from 115 kg to 98 kg. The treatment continued as the patient and his family returned home. After two years of observation, the patient no longer complains of excruciating pain in his lower legs and weighs 73 kg. The patient attends boarding school and has an active lifestyle, as seen in **Figure 5**.

DISCUSSION

Management of obesity is classified as non-pharmacological and pharmacological methods. The World Health Organization recommends 60 minutes of moderate to vigorous physical activity daily for children aged 5 to 17. This activity should be primarily high-intensity aerobic activity performed at least 3 times weekly to strengthen muscles and bones.¹ However, children worldwide are not getting enough physical activity, and girls are especially at risk at the onset of puberty.²⁻⁴ Our patient's sedentary lifestyle is consistent



Figure 1. Patient's condition when hospitalized due to experiencing overall weakness for 10 days.



Figure 2. Patient's clinical condition on November 2020. BW 115 kg, BW/ Age >P97, BW/BL 250%, BMI/ Age > P97, BMI 47.9. Intervention during hospitalization.



Figure 3. Patient's clinical condition on March 2021. BW 98 kg, BW/ Age >P97, BW/BL 217%, BMI/ Age > P97, BMI 40.7 (Discharge from hospital).



Figure 4. Patient's clinical condition on May 2021. BW 89 kg, BW/ Age >P97, BW/BL 193%, BMI/ Age > P97, and BMI 36.7



Figure 5. Patient's clinical condition two years after discharge from the hospital. BW 73 kg, BW/BL 83.5%, BMI 28.5

with research showing that obese children are less active than their normal-weight peers.⁵⁻⁷

The patient spent much time looking for happiness in front of the screen. From 2-8 pm onwards, he started watching TV and binge-eating. The current advice recommends that children aged 5 to 17 limit screen time to 2 hours daily and stop sitting for long periods.⁸⁻⁹ Studies have shown that children with increased inactive time, less physical activity and reduced sleep have higher levels of obesity.¹⁰ Current approaches considering children's 24-hour activity have shown a positive correlation between sitting time and BMI.⁷ Furthermore, when adolescents spend significant time inactive, less time is available for other physical activities.¹¹ For example, there is evidence that excessive screen use after school or on weekends reduces opportunities for physical activity.^{12,13}

Several opportunities for physical activity were discovered, including his passion for cycling and dancing. In a study of adolescent boys, researchers found a

small to moderate positive relationship between exercise and happiness.¹⁴ Another contributor may be living near schools, supported by the documented association between living near schools and active commuting.⁴ The patient and his family have previously successfully integrated some sideline activities (housework, shopping, and walking during school holidays), and there is evidence that increasing occasional light exercise has similarly beneficial effects on health outcomes.^{15,16}

The patient developed bilateral flat feet and genu valgus. BMI was associated with the degree of genu valgus in children with lower extremity pain.¹⁷ Changes in knee posture can affect load distribution patterns across the joint, putting obese children at greater risk for osteoarthritis.¹⁸ In fact, degeneration of intra-articular cartilage has been observed in at least one region of the knee in obese adolescents.¹⁹ Preliminary studies suggest that anatomical tibiofemoral angle may predict sedentary behavior time.²⁰ The knee isn't the only lower body joint that can deform. Even in

a two-year-old child, the metatarsals are disproportionately loaded by body weight and the longitudinal arch is flattened.²¹ These features, combined with increased fat deposition in the feet, are associated with flat feet and foot pain.^{22,23} BMI has also been shown to be a strong predictor of head and spine posture, correlating with head extension, thoracic kyphosis, and lumbar lordosis.²⁴

For every 10 kg increase in body weight or 3% increase in body mass index, there is a 10% increased likelihood of joint problems in the back, knees, hips and ankles.²⁵ Lower extremity pain symptoms are more severe and more common in obese children than in normal-weight children.^{26,27} Girls have a higher incidence of pain in any part of the body than men and have more pain-related disabilities.²⁸ The knee is the most common site of chronic and acute pain in obese children, with up to 64% of children reporting "occasional" to "often" pain.^{29,30} When symptom onset occurs, children with higher BMI percentiles have pain symptoms that last more than twice as long as children with higher BMI percentiles.²⁸ Musculoskeletal pain in obese children often hinders participation in physical activity, interfering with proper weight management.³¹ This patient presented with excruciating pain in his lower leg, which complicated him to do his daily activity normally.

The patient is often bullied in PE class because he is different from other students. The literature frequently cites these perspectives documenting exercise victimization in obese children.³² Patient's main social supports were his mother, his closest friends, and his sister, all of whom were less active by our subjective assessment. Biddle SJH et al. examined the association between social and physical activity and found that parental support was associated with increased physical activity among adolescents. For example, parents encourage children to be physically active and engage in instrumental behaviors (e.g., by providing transportation for physical activity). Furthermore, children were 1.4 times more likely to be inactive when their parents lacked social elements.⁴ Qualitative research has also found that lack of peer support for physical activity is a typical barrier to participation, which is

particularly important given that patient is entering adolescence, a time of increased peer pressure.³²⁻³⁴

In the general pediatric population, decreased physical ability (an overall term encompassing motor skills, confidence, motivation, and enjoyment) was associated with lower participation in physical activity. To this end, a growing body of research has recently investigated the role of exercise capacity in maintaining optimal body weight in children through its impact on opportunities for physical activity.³⁵ Poor motor skills during development are associated with obesity, leading to a downward withdrawal spiral from physical activity throughout childhood.³⁶⁻³⁸ Obesity is associated with impaired motor skills in early childhood in obese children, resulting in decreased physical activity.³⁴ Many obese children may miss out on opportunities to improve motor skills, limiting physical activity and health-related fitness opportunities throughout childhood.^{39,40} As a result, it is not obesity alone that causes poor motor competency, but rather the developmental alterations that follow from an obese upbringing.

Gait analysis reveals the timing of gait phases and inefficient gait patterns as the patient walks. Overweight children spend significantly more time in the stance phase of the gait cycle than in the swing phase. It has long been thought that such temporal signature shifts may improve perceptual stability in children.⁴¹ Likewise, longer gear transition durations (including load reaction and forward momentum) suggest that the system regulates how excess mass is transferred from one limb to the other.⁴² However, these adaptations require higher energy expenditure, which is reflected in increased joint strength during these phases.^{43,44} Based on joint kinematic data, obese children walk with more hip and knee flexion, more proximal kinetic chain internal rotation, and more foot external rotation.⁴⁵

The kinetic results from the gait study supported the patient's musculoskeletal pain. When walking, the absolute and normalized patellofemoral joint contact forces are proportional to body fat percentage, total body mass, and BMI.⁴⁶ Estimates of knee forces in the joint

demonstrate that obese children create significantly larger medial compartment forces while walking; the medial compartment gets around 90% of the load stress, compared to 72% in normal-weight children.⁴⁷ Children with flat feet and obesity have higher plantar foot pressures and contact areas than children of normal weight; during running exercise, children with obesity have 32% higher total peak forces at the foot than children of normal weight.⁴⁸ Furthermore, aberrant mechanical stresses and structural deformations might cause pain and deter exercise during load-bearing activities.⁴⁹

For a patient to feel successful and stop the pattern of negative engagement, his exercise experiences must be good and enjoyable (especially at the start). Interventions must be administered by competent health professionals knowledgeable about child development, pediatric musculoskeletal care, and exercise prescription (for example, pediatric physical therapists and pediatric exercise specialists). It is also important to consider how and when interventions are delivered. A community-based service that offers individualized one-on-one or small-group programs for overweight or obese children would be ideal. Still, such services are not always available or accessible. While it is outside the scope of this essay, children's persistent discomfort should always be thoroughly evaluated to rule out any underlying disorders or harmful causes. As a result, more evaluation, care, or follow-up may be required, necessitating the involvement of a multidisciplinary team.⁵⁰

According to meta-analyses, short-term aerobic, strength, or combined exercise programs lasting 6 to 36 weeks led to an average weight loss of 3.7 kg and a 3% reduction in body fat percentage in teenagers. Consistent participation improves estimated maximal cardiorespiratory fitness.⁵¹ Similarly, increasing body composition can improve motor coordination, functional mobility, and musculoskeletal discomfort in obese children when combined with regular physical activity.^{18,52}

Family-oriented activities should be prioritized. Current evidence-based guidelines for obesity management

advocate behavioral treatments that focus on the entire family, not just the child. This strategy will also likely enhance the patient's mother's and sister's health. Furthermore, each family is unique, and an effective family-centered approach builds on existing strengths while engaging in collaborative problem-solving to overcome barriers.⁵³⁻⁵⁷ Activities should be age-appropriate, easily accessible, low-cost, and enjoyable. It is also necessary to consider which modes of activity are best suited to the child or family (e.g., incidental activity, structured activity, sport, active transportation) and to target relevant physical fitness components (cardiorespiratory fitness, strength, gross motor skills, and balance).⁵⁷ The measures mentioned above will also help improve physical literacy.³⁸ Clinicians, on the other hand, will need to work with families to balance the "dose" of physical exercise with ensuring children grow confidence and competence (i.e., movement "quality") and remain intellectually engaged.⁵⁰ Any management strategy should also aim to empower families by offering information about physical activity and mobility (improving health literacy).⁵⁶ For example, providing accessible, trustworthy, and user-friendly resources with activity ideas, such as 24-hour movement guidelines.^{8,9}

Increase incidental movement and decrease sedentary behavior. Given that patient is far from achieving current activity requirements and is encountering a variety of physical impediments, his activity must be gradually increased.¹ Reducing the frequency of long periods of sedentary behavior may be an important first step toward increasing mobility opportunities. Sedentary bouts that are shorter and more frequent are inversely connected to total fat mass index.⁵⁸ After acclimating to less sitting time, structured exercises with different components can be performed. This reduction will free up time for these activities, but studies show that tiny shifts (15 minutes) from passive to moderate-to-vigorous physical activity can reduce central adiposity.¹¹ Encourage regular breaks, such as getting up during advertisements, when participating in screen time. Sedentary activity can also be reduced by increasing incidental activity, such as housework, cooking or food

preparation, or planting and maintaining a vegetable or herb garden.⁹

A comprehensive neuromuscular training program that incorporates a variety of activities (e.g., improving strength, aerobic fitness, and gross motor skills) is believed to be more consistent with the way children play and exercise in everyday life and has been shown to improve primary school age-appropriate health and skills-related health.^{50,59} An exercise program should include time spent in a range of exercises and weight-bearing movements (walking, jogging, aerobics, and dancing) to minimize changes in joint forces and discomfort. Getting obese children to lead more active lifestyles can be difficult. However, this can be helped by introducing the activity gradually and non-threateningly while minimizing pain and incorporating play activities. Playing video games with friends with similar interests tests the neuromuscular system while reducing sedentary time.⁶⁰ Dance-based support groups have also been shown to help attract obese teenage and reduce physical inactivity.⁶¹ Going to school with friends daily can break the sedentary habits of the school day and provide the social support needed to keep the activities going. Maybe also work with the patient's physical education teacher to develop a more inclusive strategy for obese students. Noncompetitive environments, low-impact activities, intermittent bursts of activity, and the breakdown of stressful activities can all be part of this approach. The taunting issue during PE may also necessitate discussing a supportive atmosphere with the school, teachers, or counselors.⁶²⁻⁶⁴

The patient's daily exercise should gradually increase from low to moderate intensity to include additional bouts of high-intensity physical activity. Patients will find a planned, intense workout routine physically painful and distasteful. We recommend beginning with low-to-moderate-intensity activity to avoid a negative affective response to high-intensity activity, especially as happy feelings during exercise have been linked to greater engagement in regular moderate-to-vigorous physical activity.⁶⁵ Prolonged load-bearing activity during the early stages of the program is likely

to be physiologically uncomfortable in terms of knee and foot discomfort, cardiovascular reactions, joint alignment, and low fitness. There are several potential solutions: 1) divide the exercise into low-impact, intermittent bouts; 2) investigate movement possibilities that are less threatening and more like play; and/or 3) begin the program with unloaded, pleasurable activities such as swimming or cycling, then gradually incorporate different or new load-bearing activities over weeks.⁶⁶

The patient's weight has been linked to poorer gross motor skills, poorer balance, poorer motor planning, and poorer coordination, which affects the ability to move efficiently and effectively. Fortunately, some evidence-based therapies have been shown to alter this process and improve motor skills.^{43,67} Evidence suggests that task-oriented, goal-oriented exercise therapy can be used to practice specific gross motor skills (e.g., throwing, catching, jogging, kicking, etc.) with an emphasis on improving the quality of movement. Play-based activities in restricted stance situations (e.g., walking between thin lines, balance beam walking) and single-limb stance activities (e.g., stepping stones, kicking games, balancing on one leg) might help improve balance. These modalities, such as dance training, can also be included in programming interventions.⁶⁸

Strength deficits should also be targeted, as evidenced by research indicating physical fitness gains with strength training and beneficial correlations between muscular fitness and physical activity.^{69,70} However, changes should be made to all strength training exercises at first to ensure success and confidence. Focusing on functional movements such as stair climbing, getting up and down from the floor, half squats, or modified lunges in several directions may help create confidence, improve functional mobility, and lay the groundwork for more complex movements in the future. Low-grade vertical motions involving the lower body could be gradually introduced over time, provided they are pain-free and proceed from low-impact to high-impact activities (e.g., jumping). Upper-body strengthening routines should also be included. Participation in upper-

body-supported strength activities such as push-ups or planking may need to be modified first (e.g., wall push-ups). Muscle strength can also be developed by using household objects creatively while performing modified squats, lunges, or pushing-pulling exercises. Several of these exercises also engage the core and pelvic muscles, crucial for overall strong mobility and lowering the risk of low back pain. Glute bridges, quadruped lifts, modified side planks, and standing rotations with a low weight are examples of core and pelvic workouts. Furthermore, continuing advancement from simple to complicated movement over time will strengthen the musculoskeletal system's durability against injury.^{62,64,66}

Incorporating aerobic and strength training modalities or activities is critical for improving cardiorespiratory fitness and muscle strength, which benefits obesity and cardiometabolic health.⁷¹ While one mode can increase fitness and muscle strength, combining modes in an exercise program maximizes the program's influence on various areas of physical fitness.^{72,73}

Increase awareness of musculoskeletal pain and its impediments to advancement. It is vital to recognize pain and identify and treat relevant variables. Clinicians should explain to the child and parent that pain is a symptom that must be controlled and that adequate exercise will not harm joint health. Pain should not get acutely worse or vary in quality (from aching to sharp) during exercise, should not induce a limp or change in normal mobility, and should not last more than 24 hours after exercise.⁷² If a child with obesity attempts a new activity that causes persistent discomfort, the intensity or duration is most likely too intense, and a reduction in the intensity of the prescription factors can be altered to avoid this pain. Importantly, data suggest that acute high-intensity exercise increases endogenous pain regulation. While walking may produce some musculoskeletal discomfort at first, symptoms are likely to fade as the exercise progresses.⁷⁴

Monitoring activity progress through regular contact and activity diaries can help raise awareness, celebrate success, and identify impediments. Encourage obese

youngsters to focus on the positives of what they can achieve and the tiny gains they make over time with constant involvement in the plan. Encourage obese children to keep a notebook of their pain responses for each type of activity, including severity (using a 0 to 10 numerical pain rating scale), type (aching, dull, sharp, burning, and how the quality of pain changes), and duration (Did the pain improve during the activity? Is it getting worse or staying the same? (Did the soreness continue the next day?) After a few weeks of utilizing this strategy, patterns will emerge that can be used to drive changes to activity parameters.^{54,55}

This case report focuses on managing obesity from a non-pharmacological perspective, namely by increasing activity and the role of family support. This is the strength and limitation of this study. In the next case report, a complete discussion of obesity management can be carried out from a pharmacological aspect, regarding proper nutrition in obesity and treatment according to complications in a comprehensive manner.

CONCLUSIONS

When treating overweight children, the family and the surrounding environment are crucial. Working with children and families to carefully create and gradually progress exercise and activity therapies as children gain new capacity and confidence can result in functional gains. Encouragement of inactive time reductions and increases in incidental activity are equally essential measures. Thorough clinical assessment and management should include play-based, family-centered approaches by adequately qualified doctors (experienced in child development, exercise prescription, and pediatric musculoskeletal management). Furthermore, by personalizing activity and exercise to ensure children achieve movement success, we can interrupt a cycle of negative engagement and facilitate long-term obesity treatment.

CONFLICT OF INTEREST

The author reports no conflicts of interest in this work.

ETHICS CONSIDERATION

Informed consent was obtained from the patient based on the COPE and ICMJE protocols regarding the publication ethics before the study was conducted.

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AUTHOR CONTRIBUTIONS

All review authors contributed to the development of the case report. All authors have read and agreed to the published version of the manuscript.

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