

Management of Adolescent Malnutrition with Physical Exercise: Systematic review

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Abstract

Background: Adolescence is a vital stage of development during the human lifespan in which transition, when habits are formed, persists into adult life. Teenagers are nutritionally fragile due to high growth needs, their feeding habits, and their vulnerability to external factors. Assessment of high-risk patients of malnutrition at an early stage allows for early intervention with nutritional or physical therapy. **Method:** This systematic review was carried out, including PubMed, Google Scholar, and EBSCO. Topics concerning the relationship between malnutrition and physical activity among adolescents and other articles were used in making the article. No software was utilized to analyze the data. **Results and Conclusion:** The review included 8 randomized studies that documented a strong association between physical exercise, physical activity, and the nutritional status of the individual as more muscular exercise increases healthy dietary habits and improves the body build and physical fitness of adolescents. Adolescent care physicians are ideally placed to deliver powerful messages promoting physical activity and behavior change.

Keywords: Adolescence, Management, malnutrition, physical exercise, physical activity

INTRODUCTION

Adolescence is a vital stage of development during the human lifespan in which transition, when habits are formed, persists into adult life. Good practices, such as exercise and a balanced diet, are expected to offer multiple advantages, including better success at school [1]. Lifestyle choices and behavioral patterns established in this life period is important and persist with an individual's lifetime [2]. Investing in teen wellbeing offers triple profits: increased health for teenagers today, their future adult lives, and their children [3].

However, in many developing countries, malnutrition remains a major cause of preventable mortality and morbidity among children and adolescents; malnutrition is a continuously decreasing problem as reported in previous studies [4]. The most common nutritional issues in teenagers today are obesity, anemia, and eating disorders. Incidence of early childhood under-nutrition or malnutrition can result in long-term consequences such as impaired gross and fine motor skills, simple fatigue, behavioral difficulties, impaired rapid sequence movements, lack of flexibility, and cognitive disability, such as short attention span, cognitive impairments, learning disorders, and low intelligence scores [5]. Teenagers are nutritionally fragile due to high growth needs, their feeding habits, and their vulnerability to external factors. Sustained nutritious diets and healthy eating habits over this time can resolve nutrient deficiencies

and linear development faltering during the first decade of existence and can reduce unhealthy activities that lead to the epidemic of non-communicable diseases in maturity [6]. Assessment of high-risk patients of malnutrition at an early stage allows for early intervention with physical or nutritional therapy [7].

Various variables that decide the outcome of malnutrition include birth weight, breastfeeding, infection, medical intervention, caregiver factors, efficacy of diet services, and quality of life [8].

The physiological function of malnutrition affects the clinical outcome as it affects the recovery and function of

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the organ systems [9-13]. A deficient adolescent diet will theoretically slow down growth and sexual development. Inadequate diet often places teens at high risk of chronic illness, but the adverse consequences occur over a long period of time [14].

Low cardiorespiratory fitness, physical inactivity, and sedentary behavior are all risk factors for the development of chronic diseases resulting in high morbidity and mortality rates, and also an economic burden to wider society from the social and health care provision, and decreased occupational productivity [15]. Physical activity and fitness prescription in conjunction with neuro-motor disorders and the wellness profile of children with malnutrition is seldom performed in resource-limited settings [16]. A previous study indicates that 86% of 13–15 year-olds do not achieve the required standards of physical activity. Overall, 84% of teenagers aged 11–17 years were not physically active enough in 2010 [17].

Numerous reports from specialist and patient associations, including the Royal College of Physicians, have addressed the challenges of malnutrition. Unfortunately, in many institutions, the quality of treatment remains low [18].

Aim of the Study:

To discuss the results of previous investigations studying the effect of physical activity in the management and prevention of malnutrition among adolescents.

METHODS AND MATERIALS

Sample & Study Groups

PubMed and EBSCO Information Services were chosen as the search databases for the publications used within the study, as they are high-quality sources. PubMed is one of the largest digital libraries on the internet developed by the

National Center for Biotechnology Information (NCBI), which is a part of the United States National Library of Medicine. Topics concerning the relationship between malnutrition and physical activity among adolescents and other articles were used in making the article. The found articles were screened by titles and reviewing the abstracts. Inclusion criteria: As shown in figure (1) the articles were selected based on the relevance to the project which should include one of the following topics; ‘adolescent malnutrition, physical activity and malnutrition, adolescent physical inactivity’. Exclusion criteria: all other articles, which did not have one of these topics as their primary end, or repeated studies, and reviews studies were excluded.

Statistical Analysis

No software was utilized to analyze the data. The data was extracted based on a specific form that contains (Title of the publication, author’s name, objective, summary, results, and outcomes). Double revision of each member’s outcomes was applied to ensure the validity and minimize the mistakes.

During articles selection, studies were double-reviewed, and their results to assure that we enroll the studies related to the objective of our study, and to avoid or minimize errors in the results.

RESULTS:

The search of the mentioned databases returned a total of 57 studies that were included for title screening, 41 of them were included for abstract screening, which led to the exclusion of 19 articles. The remaining 22 publications' full-texts were reviewed. The full-text revision led to the exclusion of 14 studies, and 8 were enrolled for final data extraction (Table 1).

The included studies had different study designs.

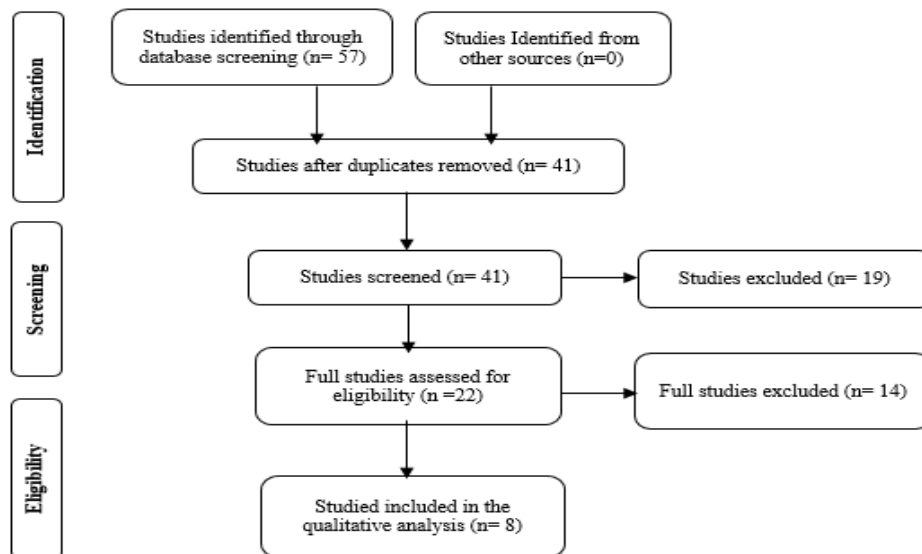


Figure 1: Flow chart representing the process of data extraction for the study

Table 1: Author, country, year of publication, methodology, and results:

Authors	Methodology and Objective	Results and Conclusion
C. Beaudart <i>et al.</i> ^[19]	Systematic review summarizes the effect of the combined intervention of nutrition and exercise on muscle function and mass.	Physical exercise has a beneficial effect on muscle function and mass. However, the interactive impact of dietary supplementation seems to be minimal.
Yaméogo, Charles W <i>et al.</i> ^[20]	A cross-sectional study included 1609 children to evaluate the physical activity levels in young children with moderate acute malnutrition and to identify the sociodemographic, anthropometric, biochemical, and clinical correlation of physical activity.	In children with moderate acute malnutrition, physical activity declines with age and has an inverse relationship with inflammatory and infection status.
Babirekere-Iriso, E. <i>et al.</i> ^[21]	A prospective study among 69 participants to evaluate the predictors and level of physical activity at discharge among children recovering from severe acute malnutrition	The study reported that the level of physical activity in children with severe acute malnutrition was low. Evaluation of physical activity may be utilized as a recovery marker.
Kumar B, <i>et al.</i> ^[5]	Review article	Physical activity promotion offers a therapeutic and preventative tool for reducing economic burden, mortality, and morbidity from non-communicable diseases related to lifestyle.
Bülbül, Selda. ^[22]	The review article focuses on exercise therapy that is very beneficial for both obese and healthy children.	Regular physical activity is an essential factor in the control of body structure during development. However, changes in the person's body during development influence the strength and output of the child such that it is important to schedule the activity according to the specific attributes, age, and sex of the young person.
E. Bénéfice <i>et al.</i> ^[23]	This research explored the impact of chronic malnutrition on functional ability, and physical activity patterns for a cohort of 100 healthy children between the ages of 10 and 13.	The study reported a negative impact of malnutrition on children's physical activity.
Jackson DB, Beaver KM. ^[24]	Review article included data from the National Longitudinal Study of Adolescent Health (Add Health)	Nutrition and exercise influences during puberty affect verbal intelligence during adulthood. Limitations are acknowledged and recommendations are outlined for potential study.
Bekele A and Janakiraman B ^[16]	Review article	Early exercises and physical therapy interventions have a role in the management of malnutrition in children.

DISCUSSION:

Understanding the nutritional requirements of teenagers may be a significant step in disrupting the vicious cycle of intergenerational hunger, chronic conditions ^[25]. So many studies are concerned with the nutritional status of under-five-year children as nutritional health in this stage of life is correlated with many other lifelong factors. Extremely little study has been performed to explore the cause of malnutrition in adolescents ^[26].

Global School-Based Student Health Survey in 2015 reported based on surveys that; 10.9% of adolescent students were underweight, 6.7% were overweight and 0.6% were obese ^[27]. Another cross-sectional study conducted on school-going adolescent girls aged between 9–16 years found that the overall prevalence of thinness, stunting, and underweight was 14.94%, 21.08%, and 31.98%, respectively ^[16].

Physical exercise, along with dietary intervention, has rapidly become an unavoidable mix, with new research indicating strong associations between malnutrition and other disorders that lead to a major burden in worldwide settings ^[28]. Malnutrition is characterized by a lack of body

weight, muscle mass, and strength and is considered an etiological cause in the growth of frailty ^[29].

A previous survey was performed on 362 children who were admitted to the pediatric unit for extreme malnutrition were later sent to the Physical Therapy Department for disability care, of which 82.1% were < 5 years of age. These children were impacted by developmental stimulus (play therapy), the findings demonstrated progress in self-care, mobility, and the resultant impact of the Pediatric Disability Inventory Assessment score ^[30]. Although physical exercise is correlated with the nutritional status assessed at one point in time, nutritional recovery is also significant. As the transition in nutritional status from admission to discharge represents rehabilitation, our linear regression models measured the nutritional status of the discharge as an indicator of physical activity by changing the admission values to determine the effect of recovery percentage ^[21].

In a previous study; a 5-fold higher level of activity in children suggests that the degree of malnutrition is a possible determinant of movement in this age group ^[20]. In another study, higher hemoglobin was correlated with greater physical exercise, as it was also seen in children in

Mexico and Indonesia^[31, 32]. Evidence found that a variety of treatments, including diet, physical exercise, knowledge, attitudes, or activities related to health, has the potential to reduce the risk factors related to obesity in pre-adolescent girls, but the durability of the impact of such approaches is less evident^[33].

Current reviews on diet promotion and the prevention of obesity have overlapping age ranges, including infants, teenagers, and teens. The results of previous reviews showed positive outcomes of interventions that incorporate the promotion of healthy diet patterns and physical exercise on the reduction of obesity in children and teenagers, in particular school-based programs^[34, 35].

CONCLUSION:

Malnutrition is a silent problem and one of the most widespread causes of morbidity and mortality in adolescents worldwide. Results of previous studies documented a strong association between physical exercise, physical activity and the nutritional status of the individual as more muscular exercise increases healthy dietary habits and improves the body build and physical fitness of adolescents. Physicians caring for adolescents are ideally placed to deliver powerful messages promoting physical activity and behavior change.

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