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IMPACT OF ADOLESCENCE DEVELOPING CHANGES AND NUTRITIONAL FACTORS ON ACADEMIC PERFORMANCE IN ADOLESCENTS

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Abstract:

Adolescence period is very crucial period where physical and psychological changes occurs and they need more nutrition than childhood period. There is a strong association of nutritional status with school performance because nutrition has been connected to both brain development and cognitive abilities. This study attempts to review the prior studies on the effect of nutritional factors on academic performance in adolescents.

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INTRODUCTION:

Adolescence is the period of life that occurs between childhood and adulthood. It is a separate stage in human development that is critical in laying the groundwork for long-term health. Teenagers experience rapid physical, cognitive, and emotional development. This influences their feelings, thoughts, decisions, and interactions with others [1]. The average age range for reaching puberty is between 9 and 14 years for girls and between 10 and 17 years for boys [2]. Even though the adolescent years are often seen as a healthy time of life, they are distinguished by a significant amount of death, disease, and injury. Much of this is avoidable or treatable.

Academic performance is generally tied to intelligence. Intelligence has been recognised by researchers as a trait that is influenced by both inherited and environmental factors. Although genetic variables are primarily responsible for cognitive abilities, environmental influences are equally important for the stability and development of cognitive abilities. [3].

This period is active process in which a rapid physical, biochemical, cognitive, psychological, and social growth, development, and maturation take place.

Physical changes in adolescence:

The hypothalamic-pituitary-gonadal axis matures and becomes active at the beginning of this phase as a result of coordinated action of intricate neuroendocrine systems. The anterior pituitary gland's gonadotropic cells release luteinizing hormone (LH) and follicle-stimulating hormone (FSH) in response to GnRH. The Leydig and Sertoli cells in the testes as well as the theca and granulosa cells in the ovary are impacted by FSH and LH [4]. The release of mature oocytes from the ovary (first ovulation) and mature spermatozoa from the testicles (first ejaculation) in women and men, respectively, is caused by the secretion of sex hormones, primarily testosterone, oestrogen, and progesterone. [5]. Physical changes include an increase in height and weight, the emergence of secondary sexual characteristics, and the onset of puberty, a stage of adolescence characterised primarily by biological diversity linked to hereditary factors and individual variability. Due to the influence of the androgen hormone, guys have higher strength and muscle build during puberty than girls [6] Rapid growth and development of the respiratory and circulatory systems, as well as alterations to the neurological system, take place [7].

Cognitive and psychological changes in adolescence:

Cognitive and emotional changes that take place throughout the transition from childhood to early adulthood are accompanied by neurobiological alterations.[8] The development of executive functions, such as abstract thought, organisation, decision making and planning, and response inhibition, is where cognitive processing speed and intellectual functioning show the most dramatic improvements throughout late childhood and adolescence.[9][10]

Psychosocial development is another shift that takes place during adolescence[11] . It is believed that stress at this time affects both biological and psychological development, with poor coping methods having long-term effects. [12].There is a considerable positive correlation between students' psychological adjustment and academic achievement. [13].

The prefrontal cortex, which is responsible for higher cognitive functions [14] plays a critical role in the cognition, emotions, and behaviours of emerging adolescents [15]. Therefore, children and adolescents face difficulties regulating emotions since the structures associated with emotional responses such as the amygdala and ventral striatum mature earlier than the Prefrontal cortex which is involved in cognitive control and executive functioning [16].

Nutritional Aspects:

Children need to be given nutrients which is essential for physical and cognitive growth and development.it is important to give necessary provisions during the pregnancy and sickness stage.

healthy eating habits should be encouraged. Investigations on animals and humans conducted revealed that Metabolic influences on GnRH secretion The normal operation of the hypothalamic-pituitary-gonadal axis is regulated by metabolic and dietary parameters[17]. For pubertal development and reproduction, a threshold bodyweight is required. The peripheral hormones, such as leptin, insulin, and ghrelin, has provided valuable insights into the neuroendocrine pathways that connect metabolism and reproduction [18].

All of the cells in the human body, including neurons get their energy from calories in food that contain proteins, carbohydrates and fats.[19] Additionally, micronutrients assist effective transmission along these routes and the synthesis of neurotransmitters, which are the brain chemicals helps for transferring

information across synapses. [20] Certain vitamin or mineral deficiencies or excess can harm brain nerves, altering memory, reducing problem-solving skills, and decreasing brain function. [21] One of the key elements that may have an impact on academic accomplishment is a student's nutritional status, which may limit their capacity to study.[22]

METHODOLOGY:

A search of literature was done systematically to access published studies, on the effects of pubertal changes and nutrition on the academic performance of adolescents. A primary search was done with Google Search to assess the keywords to be used in the main literature search. The main search was done in PubMed, Google Scholar and MEDLINE with the identified keywords and combinations: "adolescent brain" and "hormones," and "steroids," "brain development" and "adolescence," "brain development" and "hormones," "brain development" and "puberty," food, diet, dietary pattern, quality diet, school, children, academic performance, adolescent. A final search was done in the reference list of selected studies for additional studies.

DISCUSSION:

Adolescence is a vulnerable life stage because nutrient requirements exceed than childhood. Food s one of the basic needs of an individual and Nutritional requirements (macronutrients and micronutrients) is one of the internal factors that may affect academic achievement [23]. Undernutrition delays academic progress by impairing motivation, cognitive development, growth, and mental development. The recent research has shown that obese adolescents have lower cognitive performance, indicating that the cognitive abilities may also be affected by nutrition [24].

Body mass index (BMI) is a key predictor of academic achievement, attendance, behaviour, and physical fitness in students [25]. When compared across gender and ages, anthropometric measurements are crucial indicators for determining adolescents' nutritional health. According to a study, academic achievement and body mass index are closely related [26].and being overweight or obese is related with lower levels of academic accomplishment [27].

Malnutrition is mainly due to inadequate intake of protein, carbohydrates, micronutrients Disease-related malnutrition like malabsorption from intestine, alteration in metabolism of food. Malnutrition is considered a problem that can limit the child's ability to learn, resulting in lower academic achievement compared with children with good nutrition [28]. Micronutrient status is crucial for healthy childhood development. Severe anaemia, which can be caused by a lack of iron, folate, or vitamin B12, among other things, has a severe impact on work capacity, intellectual performance, and child cognitive development [29]. Sufficient iodine is essential for a growing child's brain development [30], zinc is essential for many biologic activities and zinc deficiency can also affect progress of brain [31]. Adequate intake of calcium is important for skeletal growth [32]. It was also found that the levels of all biochemical markers, alter among people who are obese, overweight, or normal weight [33].

Iron deficiency is one of the leading causes for Anemia, which decreases oxygen carrying capacity of blood. It may cause Symptoms like fatigue, weakness, and a reduction in work capacity and breathing problem and cause behavioural problems and poor cognition [34,35]. And some other studies show Iron supplementation boosted attention and focus independent of baseline iron status and improve cognition and psychomotor outcomes in anaemic infants and children [36,37]. The physical activity is a major factor indicates that children with poor motor skills appear to have a greater prevalence of childhood obesity and poor academic performance [38].

Research evidences also show that academic performance is affected by factors such as the economic conditions, social discriminations, parent education level, wealth status of the parents and job-related status of the adolescents. Teenagers from low-income socioeconomic status groups have been found to have poor nutrition, decreased calcium intakes, limited access to medical care, and a lack of immunisations. Other study shows that there is a significant and positive correlation between socio-economic status and Academic achievement among adolescents [39].

CONCLUSION:

It is clear from this review that teenagers require a healthy diet in order to develop properly. The growth of the physical and cognitive development will be hampered by malnutrition. Obesity will have a detrimental effect on academic performance through affecting health, work capacity, and lifespan quality. This review provides recommendations on how to address nutritional problems and developmental changes in adolescent populations. We can empower adolescents to make informed choices and build lifetime healthy eating habits by increasing awareness,

giving education, and creating a supportive atmosphere.

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