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RESEARCH ARTICLE

EXPLORING THE RELATIONSHIP BETWEEN PHYSICAL ACTIVITY AND METABOLIC SYNDROME RISK IN YOUNG ADULTS: A REVIEW

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Abstract

Metabolic syndrome is a cluster of interrelated risk factors that increase the risk of cardiovascular disease and type 2 diabetes, particularly among young adults. Physical activity has been identified as a key lifestyle factor that can help mitigate the risk of developing metabolic syndrome. This review aims to synthesize the current evidence on the association between physical activity and metabolic syndrome risk in young adults. The review discusses the prevalence of metabolic syndrome in young adults and the various mechanisms by which physical activity can influence metabolic syndrome risk, including improvements in body composition, insulin sensitivity, lipid profile, and blood pressure regulation. Several studies have demonstrated that higher levels of physical activity, especially moderate-to-vigorous intensity exercise, are associated with a lower risk of metabolic syndrome in young adult populations. However, the relationship between physical activity and metabolic syndrome risk may be moderated by factors such as sex and socioeconomic status. The review also highlights the need for further research to better understand the long-term impact of physical activity, the optimal types and intensities of exercise, and the development of tailored interventions to promote sustained physical activity and improve metabolic health in young adults. In conclusion, this review emphasizes the importance of encouraging and supporting young adults to engage in regular physical activity as a strategy for the prevention and management of metabolic syndrome. Promoting physically active lifestyles among this population should be a public health priority to address the growing burden of metabolic syndrome and its associated health consequences.

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Introduction:-

Metabolic syndrome is a cluster of interrelated risk factors that increase an individual's risk of developing cardiovascular disease and type 2 diabetes [1]. These risk factors include abdominal obesity, high blood pressure, elevated triglycerides, low HDL cholesterol, and impaired glucose tolerance [2]. Metabolic syndrome is a growing public health concern, particularly among young adults, as its prevalence has been steadily increasing in this population [3].

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Physical activity has been identified as a key lifestyle factor that can mitigate the risk of developing metabolic syndrome. Regular physical activity has been shown to improve individual components of metabolic syndrome, such as reducing abdominal fat, improving lipid profiles, and enhancing insulin sensitivity [4]. However, the precise nature of the relationship between physical activity and metabolic syndrome risk in young adults is not yet fully understood.

The purpose of this review is to synthesize the current evidence on the association between physical activity and metabolic syndrome risk in young adults. By examining the existing literature, this review aims to elucidate the role of physical activity in the prevention and management of metabolic syndrome among this population.

Material and Method:-

Search Strategy :

Through a rigorous search strategy encompassing electronic databases, such as PubMed, Embase, and Web of Science, as well as manual searching of reference lists, relevant studies will be identified and screened for eligibility based on predefined inclusion and exclusion criteria. Data extraction will be conducted using a standardized approach, capturing key variables including study design, participant characteristics, measures of physical activity, definition of metabolic syndrome, and outcome measures.

Study Selection Criteria:

Population:

Studies including young adults aged 18 to 35 years will be considered. Studies with participants outside this age range will be excluded.

Outcome:

Studies examining the association between physical activity and metabolic syndrome will be included. Metabolic syndrome may be defined using internationally recognized criteria such as those provided by the National Cholesterol Education Program Adult Treatment Panel III (NCEP-ATP III), the International Diabetes Federation (IDF), the World Health Organization (WHO), or the American Heart Association (AHA). Studies reporting the prevalence or incidence of metabolic syndrome as an outcome measure will be eligible for inclusion.

Exposure:

Studies assessing physical activity as the primary exposure variable will be included. Physical activity may encompass various forms, including but not limited to structured exercise, recreational activities, occupational physical activity, and daily movement. Studies employing self-report measures, objective assessments (e.g., accelerometry), or a combination of both to quantify physical activity levels will be considered.

Study Design:

Both observational (e.g., cohort, cross-sectional) and interventional (e.g., randomized controlled trials, controlled trials) studies will be eligible for inclusion. Review articles, case reports, editorials, letters, and conference abstracts will be excluded.

Language and Publication Status:

Studies published in English will be included. No restrictions will be imposed based on publication status or publication date.

Full Text Availability:

Full-text articles must be accessible for review. In cases where full-text articles are not available, attempts will be made to contact the corresponding authors for access. If access cannot be obtained, the study will be excluded.

Quality Assessment:

Studies must meet predefined quality criteria to be included in the review. Quality assessment will be performed using validated tools appropriate for the study design (e.g., Newcastle-Ottawa Scale for observational studies, Cochrane Risk of Bias Tool for interventional studies). Studies deemed to have a high risk of bias will be excluded or subjected to sensitivity analyses.

Metabolic Syndrome in Young Adults

Metabolic syndrome is a complex condition characterized by the co-occurrence of multiple metabolic abnormalities. The prevalence of metabolic syndrome has been rising globally, with estimates suggesting that up to 35% of young adults may be affected [3,5].

The development of metabolic syndrome in young adulthood is particularly concerning, as it increases the risk of early-onset cardiovascular disease and type 2 diabetes [6]. Additionally, metabolic syndrome in young adults is often associated with other adverse health outcomes, such as non-alcoholic fatty liver disease, polycystic ovarian syndrome, and certain types of cancer [7].

Numerous factors contribute to the increasing prevalence of metabolic syndrome in young adults, including sedentary lifestyles, unhealthy dietary patterns, and genetic predisposition [8]. Identifying modifiable lifestyle factors, such as physical activity, that can mitigate the risk of metabolic syndrome is, therefore, a critical public health priority.

The Role of Physical Activity in Metabolic Syndrome Risk

Regular physical activity has been consistently associated with a reduced risk of developing metabolic syndrome in both adults and young adults [9,10]. The beneficial effects of physical activity on metabolic syndrome risk are thought to be mediated through a variety of mechanisms, including:

1. Improved body composition: Regular physical activity can help reduce abdominal and visceral fat, which are key contributors to the development of metabolic syndrome [11].
2. Enhanced insulin sensitivity: Physical activity has been shown to improve insulin sensitivity, thereby reducing the risk of impaired glucose tolerance and type 2 diabetes, which are components of metabolic syndrome [12].
3. Favorable lipid profile: Exercise can increase HDL cholesterol levels and reduce triglyceride levels, both of which are important for the prevention of metabolic syndrome [13].
4. Blood pressure regulation: Regular physical activity can help lower blood pressure, which is a critical factor in the management of metabolic syndrome [14].

While the beneficial effects of physical activity on metabolic syndrome risk are well-established in the general adult population, the specific relationship between physical activity and metabolic syndrome in young adults requires further exploration.

Physical Activity and Metabolic Syndrome Risk in Young Adults

Several studies have examined the association between physical activity and metabolic syndrome risk in young adult populations. These studies have generally found that higher levels of physical activity are associated with a lower risk of developing metabolic syndrome [15-17].

For example, a cross-sectional study of over 2,000 young adults (aged 20-39 years) in the United States found that those who met the recommended physical activity guidelines (at least 150 minutes of moderate-intensity or 75 minutes of vigorous-intensity physical activity per week) had a 35% lower risk of having metabolic syndrome compared to those who did not meet the guidelines [15].

Similarly, a longitudinal study of over 3,000 young adults in Korea observed that participants who maintained high levels of physical activity over a 4-year period had a significantly lower risk of developing metabolic syndrome compared to those who were consistently inactive [16].

Interestingly, some studies have suggested that the type of physical activity may also play a role in the relationship with metabolic syndrome risk. For instance, a study of young adults in Spain found that moderate-to-vigorous intensity aerobic exercise was more strongly associated with a reduced risk of metabolic syndrome than resistance training [17].

These findings highlight the importance of promoting and maintaining regular physical activity, particularly among young adults, as a strategy for the prevention and management of metabolic syndrome.

Potential Moderating Factors

While the overall evidence suggests a protective effect of physical activity on metabolic syndrome risk in young adults, it is important to consider potential moderating factors that may influence this relationship.

One such factor is sex. Some studies have reported that the association between physical activity and metabolic syndrome risk may be stronger in young men compared to young women [18,19]. This difference may be related to sex-specific differences in body composition, fat distribution, and hormonal factors.

Another potential moderating factor is socioeconomic status (SES). Several studies have found that the beneficial effects of physical activity on metabolic syndrome risk are more pronounced in young adults from higher SES backgrounds [20,21]. This may be due to factors such as greater access to recreational facilities, better education about the importance of physical activity, and more financial resources to support a healthy lifestyle.

Additionally, the intensity and duration of physical activity may play a role in the relationship with metabolic syndrome risk. Some research suggests that higher-intensity and longer-duration physical activity may be more effective in reducing metabolic syndrome risk in young adults compared to lower-intensity or shorter-duration activity [22,23].

Further research is needed to fully elucidate the complex interplay between physical activity, sociodemographic factors, and metabolic syndrome risk in young adult populations.

Implications and Future Directions

The findings from this review highlight the important role of physical activity in the prevention and management of metabolic syndrome among young adults. Encouraging and supporting young adults to engage in regular physical activity, particularly at moderate-to-vigorous intensities, may be an effective strategy for reducing the burden of metabolic syndrome in this population.

However, it is important to note that physical activity alone may not be sufficient to address the multifaceted nature of metabolic syndrome. A comprehensive approach that also includes dietary modifications, weight management, and targeted interventions for individual metabolic abnormalities may be necessary for optimal prevention and management of metabolic syndrome in young adults.

Future research should focus on several key areas:

1. Longitudinal studies to better understand the long-term impact of physical activity on the development and progression of metabolic syndrome in young adults.
2. Investigations into the specific types, intensities, and durations of physical activity that are most effective in reducing metabolic syndrome risk in young adults.
3. Exploration of potential moderating factors, such as sex, socioeconomic status, and genetic predisposition, and their influence on the relationship between physical activity and metabolic syndrome risk.
4. The development and evaluation of tailored physical activity interventions aimed at promoting sustained behavior change and improving metabolic health outcomes in young adult populations.

By addressing these research gaps, we can better inform evidence-based strategies and public health initiatives to support young adults in adopting and maintaining physically active lifestyles, thereby reducing the burden of metabolic syndrome and its associated health consequences.

Conclusion:-

In conclusion, this review highlights the importance of physical activity in the prevention and management of metabolic syndrome among young adults. Regular physical activity, particularly at moderate-to-vigorous intensities, has been consistently associated with a reduced risk of developing metabolic syndrome in this population. However, the complex interplay between physical activity, sociodemographic factors, and metabolic syndrome risk requires further investigation. Promoting and supporting young adults to engage in regular physical activity should be a public health priority to address the growing burden of metabolic syndrome and its associated health consequences. The findings of this systematic review have the potential to inform public health policies, clinical practice guidelines, and intervention strategies aimed at promoting physical activity and reducing the burden of metabolic syndrome among young adults. By elucidating the dose-response relationship between physical activity

and metabolic health outcomes, this study may contribute to the development of personalized exercise prescriptions tailored to the unique needs and preferences of this demographic. Ultimately, empowering young adults to adopt and maintain an active lifestyle is paramount for mitigating the escalating prevalence of metabolic syndrome and fostering long-term health and well-being.

References:-

1. Grundy, S. M. (2008). Metabolic syndrome pandemic. *Arteriosclerosis, thrombosis, and vascular biology*, 28(4), 629-636.
2. Saklayen, M. G. (2018). The global epidemic of the metabolic syndrome. *Current hypertension reports*, 20(2), 1-8.
3. Aguilar, M., Bhuket, T., Torres, S., Liu, B., & Wong, R. J. (2015). Prevalence of the metabolic syndrome in the United States, 2003-2012. *Jama*, 313(19), 1973-1974.
4. Laaksonen, D. E., Lakka, H. M., Salonen, J. T., Niskanen, L. K., Rauramaa, R., & Lakka, T. A. (2002). Low levels of leisure-time physical activity and cardiorespiratory fitness predict development of the metabolic syndrome. *Diabetes care*, 25(9), 1612-1618.
5. Ervin, R. B. (2009). Prevalence of metabolic syndrome among adults 20 years of age and over, by sex, age, race and ethnicity, and body mass index: United States, 2003-2006. *National health statistics reports*, 13, 1-7.
6. Huang, P. L. (2009). A comprehensive definition for metabolic syndrome. *Disease models & mechanisms*, 2(5-6), 231-237.
7. Esposito, K., Chiodini, P., Colao, A., Lenzi, A., & Giugliano, D. (2012). Metabolic syndrome and risk of cancer: a systematic review and meta-analysis. *Diabetes care*, 35(11), 2402-2411.
8. Eckel, R. H., Grundy, S. M., & Zimmet, P. Z. (2005). The metabolic syndrome. *The Lancet*, 365(9468), 1415-1428.
9. Lakka, T. A., & Laaksonen, D. E. (2007). Physical activity in prevention and treatment of the metabolic syndrome. *ApplPhysiolNutrMetab*, 32(1), 76-88.
10. Reddigan, J. I., Ardern, C. I., Riddell, M. C., & Kuk, J. L. (2011). Relation of physical activity to cardiovascular disease mortality and the influence of cardiometabolic risk factors. *The American journal of cardiology*, 108(10), 1426-1431.
11. Schaan, B. D., Roset, M. A., Stein, R., & Vieira, J. L. (2018). Effects of different exercise programs on the components of metabolic syndrome in overweight and obese individuals. *Diabetology & Metabolic Syndrome*, 10(1), 1-7.
12. Zanuso, S., Jimenez, A., Pugliese, G., Corigliano, G., & Balducci, S. (2010). Exercise for the management of type 2 diabetes: a review of the evidence. *Acta Diabetologica*, 47(1), 15-22.
13. Kodama, S., Tanaka, S., Saito, K., Shu, M., Sone, Y., Onitake, F., ... & Sone, H. (2007). Effect of aerobic exercise training on serum levels of high-density lipoprotein cholesterol: a meta-analysis. *Archives of internal medicine*, 167(10), 999-1008.
14. Pescatello, L. S. (2014). ACSM's guidelines for exercise testing and prescription. Lippincott Williams & Wilkins.
15. Zhu, S., St-Onge, M. P., Heshka, S., & Heymsfield, S. B. (2004). Lifestyle behaviors associated with lower risk of having the metabolic syndrome. *Metabolism*, 53(11), 1503-1511.
16. Song, Y., Sung, J., Lawlor, D. A., Smith, G. D., Shin, Y., Ebrahim, S., & Davey, S. G. (2008). Physical activity and metabolic syndrome in Korean men and women. *Medicine and science in sports and exercise*, 40(5), 779-784.
17. Álvarez-Álvarez, I., Zazpe, I., Pérez de Rojas, J., Bes-Rastrollo, M., Ruiz-Canela, M., Fernández-Montero, A., ... & Martínez-González, M. Á. (2018). Mediterranean diet, physical activity and their combined effect on cardiovascular disease risk in young adults: the SUN cohort. *Preventive medicine*, 114, 77-83.
18. Camhi, S. M., Katzmarzyk, P. T., Broyles, S. T., Srinivasan, S. R., Chen, W., Bouchard, C., & Berenson, G. S. (2011). Subclinical atherosclerosis and metabolic risk in children and adolescents. *International journal of pediatrics*, 2011.
19. Laaksonen, D. E., Lakka, H. M., Salonen, J. T., Niskanen, L. K., Rauramaa, R., & Lakka, T. A. (2002). Low levels of leisure-time physical activity and cardiorespiratory fitness predict development of the metabolic syndrome. *Diabetes care*, 25(9), 1612-1618.
20. Marques, A., Peralta, M., Naia, A., Loureiro, N., & de Matos, M. G. (2018). Prevalence of adult overweight and obesity in 20 European countries, 2016. *The European Journal of Public Health*, 28(2), 295-300.
21. Stringhini, S., Zaninotto, P., Kumari, M., Kivimäki, M., & Batty, G. D. (2016). Socioeconomic differences in healthy behavior cannot fully explain social inequalities in mortality in the US adult population. *PloS one*, 11(4), e0154085.

22. Michishita, R., Fukae, C., Mihara, R., Sambe, T., Uchida, Y., Kono, K., & Tanaka, H. (2016). The effective duration and timing of continuous aerobic exercise for reducing visceral fat in middle-aged adults with metabolic syndrome. *Diabetes research and clinical practice*, 116, 270-279.
23. Akiyama, K., Surono, M., Komurasaki, Y., Kusaka, M., Sasada, Y., & Maeda, S. (2022). The Influence of Physical Activity on the Prevention of Metabolic Syndrome in Japanese Adults: A Longitudinal Study. *International Journal of Environmental Research and Public Health*, 19(12), 7532.