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Understanding the Risk Factors for Cardiac Arrest in Young Adults: A Systematic Review

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Abstract: Cardiac arrest is a critical medical emergency associated with high morbidity and mortality. While traditionally considered a condition affecting older individuals, there is growing evidence of an increasing incidence of cardiac arrest among young adults. This systematic review aims to comprehensively examine the literature to elucidate the risk factors contributing to cardiac arrest in this demographic. Through a rigorous search and synthesis of available evidence, this review seeks to enhance our understanding of the unique risk profile of young adults and inform targeted preventive strategies. **Methods:** A systematic search of electronic worldwide databases PubMed (Medline), Cochrane Library (Central), and Google Scholar was conducted to identify relevant studies published up to March 2024. The search strategy employed a combination of keywords related to "cardiac arrest", "sudden cardiac arrest", "risk factors" and "young adults". Title abstract phrases, related keywords, and Boolean operators ('OR' and 'AND') were all used in conjunction with the 'Advanced' search choices. **Results:** A total of 573 studies met the inclusion criteria, due to duplication, 245 records were eliminated using Mendeley Desktop software. The identified risk factors for cardiac arrest in young adults encompassed a broad range of determinants, including modifiable lifestyle factors, underlying cardiovascular conditions, genetic predisposition, and environmental influences. Modifiable risk factors such as obesity, smoking, physical inactivity, and substance abuse emerged as prominent contributors to cardiac arrest risk in this population. Predisposing factors such as inherited cardiac conditions, structural heart abnormalities, and acquired cardiac disorders were significantly identified. The titles and abstracts of the remaining 328 studies were reviewed based on the eligibility criteria. Following the initial scanning, 123 records were rejected as not satisfying the inclusion requirements. Environmental factors, including air pollution and socioeconomic status, also played a role in shaping the risk profile of young adults. The remaining 205 full-text papers were reviewed and from these articles, 196 articles were removed for the reasons. Additionally, excluded studies were scanned for any possible neglect. Total of 08 studies were included in the qualitative analysis (systematic review). **Conclusion:** This systematic review provides valuable insights into the risk factors contributing to cardiac arrest in young adults offering a foundation for evidence-based preventive measures. By addressing modifiable risk factors, enhancing genetic screening efforts, and promoting cardiovascular health awareness, healthcare providers can work towards reducing the incidence of cardiac arrest and improving outcomes in this vulnerable population.

Keywords: cardiac arrest, risk factors, systematic review, young adults, preventive measures

1. Introduction A sudden unexpected death or resuscitation from a pulseless cardiac arrest that happened either within one hour of the start of symptoms or within twenty-four hours of the patient being observed alive and symptom free was referred to as sudden cardiac arrest (SCA) (Noheria A *et al.*, 2013, Johnson, N. J., 2013). Though uncommon, sudden cardiac arrest (SCA) in younger individuals is frequently well-publicized, especially when it occurs in athletes (Katherine S *et al.*, 2018). Undiagnosed cardiovascular disorders are typically the cause of sudden cardiac arrest (SCA), which is the primary cause of nontraumatic sudden death in children and young people (Jonathan A. *et al.*, 2012). Since these people are thought to be "too young to die suddenly," the events have a terrible effect on the family as well as the community. The cardiac causes of SCA in younger individuals are varied and thought to be primarily brought on by underlying, possibly heritable heart illnesses or "primary arrhythmia syndromes" in the absence of known risk factors. Cardiomyopathies, "primary electrical disease," and premature coronary disease are the most commonly found cardiac etiologies in nearly all studies of SCA in younger individuals (Noheria A *et al.*, 2013, Katherine S *et al.*, 2018). It is difficult to identify by screening those who are at an increased risk of sudden cardiac death (SCD) since the prevalence of warning signs or symptoms varies greatly among children and young people who subsequently develop SCA. For as many as 50–80% of young athletes with sickle cell disease, sudden mortality is the earliest clinical sign of underlying cardiovascular disease. This new discovery, which indicates the existence of previously unidentified middle-aged SCA prevention issues, is the decreased prevalence of established risk markers of SCA in the middle-aged group, such as clinical history of CAD, congestive heart failure, or syncope. Future SCA burden may be affected by the strong and independent correlation between obesity and sleep apnoea in middle-aged SCA patients (Noheria A *et al.*, 2013). In this patient population, nonspecific left ventricular hypertrophy, coronary atherosclerosis, medial necrosis-related ruptured aortas, and congenital coronary abnormalities were less common cardiac causes of SCA (Meyer L *et al.*, 2012). The estimated risk for SCA was 1 per 500 000 participants and 1 per 217 400 every academic year based on the number of athletes. A more realistic estimate of the yearly incidence of SCA among young athletes is roughly 1:50 000 athletes, given that there are 500 000 competing university athletes and approximately 5 million competitive high school athletes in the US. These factors can be further classified as primary cardiac electrical problems (typically autopsy- and echocardiographic-negative), structural or functional abnormalities, and additional factors contributing to paediatric and young adult SCA. Cocaine, steroids, ephedra, and other illegal substances and stimulants are included in the "other" category (Campbell RM *et al.*, 2008). Consequently, in order to enhance risk assessment and preventive measures in the broader community, it is critical to discover additional risk factors and mediators for SCA. It is critically important for public health to determine whether sudden cardiac arrest and sudden cardiac death are associated, as well as to more precisely define the strength and form of the dose-response relationship, given the comparatively small number of established risk factors for sudden cardiac arrest. This holds significance for the purposes of primary prevention, comparative risk assessment, identification of knowledge gaps, and future research directions.

2. METHODOLOGY

2.1. Methods This systematic review were carried out in accordance with the Preferred Reporting Items for Systematic Reviews (PRISMA) guidelines (Moher *et al.*, 2009).

2.2. Data Analysis When available in the original articles, measurements were tabulated. Continuous outcomes were reported as means, standard deviations and ranges. In Noheria A *et al.*, 2013 study physician records were available and were reviewed in 1523 (76%) cases of SCA, and these comprise the subjects for subsequent analyses. The 35–59-year group of SCA cases as compared to the ≥60-year group were less likely to have hypertension (52.2% vs. 70.9%, $p < 0.0001$) or diabetes mellitus (29.1% vs. 37.2%, $p = 0.002$); and were less likely to have known coronary artery disease (21.8% vs. 46.3%, $p < 0.0001$), history of congestive heart failure (17.3% vs. 40.4%, $p < 0.0001$) or syncope (4.8% vs. 8.6%, $p = 0.008$).

3. RESULTS/FINDINGS

3.1. Search Results After doing a preliminary search across four databases—Google Scholar, Cochrane Library, PubMed—a total of 573 studies were discovered. Using Mendeley Desktop, 245 records were removed because of duplication. Based on the eligibility requirements, the titles and abstracts of the remaining 328 studies were examined. 123 records were discarded as not meeting the inclusion requirements after the first scanning. After reviewing the remaining 205 full-text papers, 197 of them were excluded for the reasons indicated in Figure 1.1. Furthermore, papers that were omitted were examined for potential neglect. The flow diagram for the investigation was shown in Figure 1.1. Eight studies in total were included in the systematic review and qualitative analysis.

3.2. Characteristics of Included Studies Table 1.1 provides characteristics of the included studies. In this review three studies are prospective cohort study, two are observational study, two are retrospective cohort study and one are cross sectional study. These studies were conducted in Portland (3), USA, Washington, Canada, Toronto, Telangana.

Table 1.1 Major characteristics of included studies

Sr. No.	Author	Study design	No. of Participants	Measurement	Results
1	Noheria A <i>et al.</i> , 2013	Prospective cohort study	Middle-aged (n = 753) compared to older (n = 1251)	Demographics and clinical characteristics of the study population	In comparison to older patients, middle-aged adults with SCA had higher rates of obesity, sleep apnea, and seizure disorder, as well as a lower prevalence of conventional clinical risk factors.
2	Yarmohammadi H <i>et al.</i> , 2017	Prospective cohort study	N=712 Compared 267 SCA cases and 445 controls	Electrolyte level creatinine clearance (CrCl), serum Ca, or serum albumin level measurements.	An independent risk factor for SCA in the general population was shown to be lower serum Ca levels.
3	Katherine S <i>et al.</i> , 2018	observational cohort study	N=608 Cases of SCA (120 survivors and 488 nonsurvivors).	Collect past medical history, circumstances, and triggers on patients with SCA	The underlying reasons of SCA in individuals between the ages of 2 and 45 are frequently seen in those who have had cardiovascular disorders previously diagnosed.
4	Bizmark RS <i>et al.</i> , 2018	Cross-Sectional study	Aged 30 years or younger were included in the study	Personal information Age, sec, paediatric SCA	The survival rates of low- and high-SCA volume Eds did not differ statistically significantly from one another. (P=0.77). Data in populations aged 30 years or older did not support regionalized care for post-SCA.
5	Meyer L <i>et al.</i> , 2012	Retrospective cohort study	N=361 (26 cases 0–2 years of age),	Patient demographics (age and sex), event circumstances	It is more prevalent than previously estimated for children and young people to experience cardiac-related out-of-hospital cardiac arrest.
6	Landry CH <i>et al.</i> , 2017	Retrospective study	N=74 (12 to 45 years of age during participation in a sport.) 16 occurred during competitive sports and 58 occurred during noncompetitive sports.	Rescu Epistry cardiac arrest database	Surrounding 100,000 athlete-years, 0.76 incidences of sudden cardiac arrest occurred during competitive sports involvement. When playing competitive sports, there was a rare incidence of abrupt cardiac arrest caused by structural heart disease.
7	Marijon <i>et al.</i> , 2015	Prospective cohort study	N=1247 (35-65 years)	Analysis of the circumstances of arrest 3. time and location of each event; (ii) clinical and demographic information Previous medical record	The concept that sports participation has a high benefit-low risk profile is reinforced by the fact that middle-aged sports-related SCA accounts for a very modest percentage of the total SCA burden.
8	Ramaka S <i>et al.</i> , 2020	observational cohort study	N= 814 (Above 18 years)	Demographics and clinical characteristics of the study population	There is no relationship between risk factors and the duration of symptoms before a hospital cardiac arrest.

4. DISCUSSION This systematic review evaluates the increasing risk of cardiac arrest in young adult. Sudden cardiac arrest (SCA) in younger people, although rare, is often a highly publicized event, particularly among athletes. SCA is the leading cause of non-traumatic sudden death in children and young adults and usually is the result of an undiagnosed cardiovascular disorder. In 2013 study more than one-third of SCA cases in individuals over 35 belonged to the middle-aged (35–59) age group, which had a higher percentage of men than the older group. The middle-aged group had fewer comorbidities, such as diabetes mellitus, hypertension, and clinical histories of CAD, congestive heart failure, or syncope, which are recognized risk factors for SCA. This is a new result that implies there are unidentified middle-aged SCA prevention issues. Traditional risk markers of SCA, such as syncope, congestive heart failure, and clinical history of CAD, are less common in this population. It is consistent with the theory that lower Ca levels may independently alter the risk of SCA that there is an inverse association between Ca levels and SCA (Yarmohammadi H *et al.*, 2017). According to prior research in this field, SCA occurrences do not primarily affect “healthy individuals” in younger people. Study found that patients with a prior medical

history of heart disease accounted for 67.9% of SCA occurrences among individuals under 45, while patients with a prior psychiatric medical history accounted for 20.1% of cases. Since few research on SCD in younger people provide this amount of detail, it is challenging to compare them with other studies (Katherine S *et al.*, 2018). Several features of emergency visits resulting from SCA were illustrated using nationally representative data. There were differences between age groups and sexes in the incidence rates of ED visits and the survival rates for SCA (Bizmark RS *et al.*, 2018). According to this research, the risk of OHCA is 1:69 000 for those aged 14 to 24 and 1:23 000 for people aged 25 to 35 years. These results are similar to those of a three-year prospective population-based study conducted in Oregon using a similar technique, which found that the incidence of OHCA in children aged 10 to 14 was 1:59 000. In military soldiers aged 18 to 35, sudden cardiac death (SCD) was estimated to occur at a rate of approximately 1 in 25 000 (Meyer L *et al.*, 2012). This systematic review evaluates the increasing risk of cardiac arrest and in this review, we used prospective cohort study, observational study and retrospective cohort study for finding the major risk of increasing number of cardiac arrests in young adult. The major strength of this systematic review is used Prisma guidelines, review the all 8 studies out of 418 studies. This systematic review has several limitations- there is no randomized controlled trial study be included, only observational retrospective and prospective cohort study is included for analysis.

5. CONCLUSION This study indicates that cardiovascular related cardiac arrest in children and young adults is more common. This data revealed a low incidence of sudden cardiac arrest caused by structural heart disease, such as hypertrophic cardiomyopathy, which is more likely to be identified by electrocardiography than other causes of abrupt cardiac arrest.

*Conflict of interest: The author has no conflicts of interest to disclose.

Reference

- Allan, K. S., Morrison, L. J., Pinter, A., Tu, J. V., Dorian, P., Rescu Investigators, & Chan, T. (2019). Unexpected high prevalence of cardiovascular disease risk factors and psychiatric disease among young people with sudden cardiac arrest. *Journal of the American Heart Association*, 8(2), e010330.
- Atkins, D. L. (2019). Sudden cardiac arrest in a young population: not so unpredictable. *Journal of the American Heart Association*, 8(2), e011700.
- Campbell, R. M., Berger, S., & Drezner, J. (2009). Sudden cardiac arrest in children and young athletes: the importance of a detailed personal and family history in the pre-participation evaluation. *British journal of sports medicine*, 43(5), 336-341.
- Johnson, N. J., Salhi, R. A., Abella, B. S., Neumar, R. W., Gaieski, D. F., & Carr, B. G. (2013). Emergency department factors associated with survival after sudden cardiac arrest. *Resuscitation*, 84(3), 292-297.
- Landry, C. H., Allan, K. S., Connelly, K. A., Cunningham, K., Morrison, L. J., & Dorian, P. (2017). Sudden cardiac arrest during participation in competitive sports. *New England journal of medicine*, 377(20), 1943-1953.
- Marijon, E., Uy-Evanado, A., Reinier, K., Teodorescu, C., Narayanan, K., Jouven, X., & Chugh, S. S. (2015). Sudden cardiac arrest during sports activity in middle age. *Circulation*, 131(16), 1384-1391.
- Meyer, L., Stubbs, B., Fahrenbruch, C., Maeda, C., Harmon, K., Eisenberg, M., & Drezner, J. (2012). Incidence, causes, and survival trends from cardiovascular-related sudden cardiac arrest in children and young adults 0 to 35 years of age: a 30-year review. *Circulation*, 126(11), 1363-1372.
- Moher D, Liberati A, Tetzlaff J, Altman G.D., The PRISMA Group (2009). Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *Plos Med*; 6(7) e1000097.
- Noheria, A., Teodorescu, C., Uy-Evanado, A., Reinier, K., Mariani, R., Gunson, K., & Chugh, S. S. (2013). Distinctive profile of sudden cardiac arrest in middle-aged vs. older adults: a community-based study. *International journal of cardiology*, 168(4), 3495-3499.
- Ramaka, S., Nazir, N. T., Murthy, V. S., Hoek, T. V., Prabhakar, B. S., Chodavarapu, R., & Weine, S. M. (2020). Epidemiology of out-of-Hospital Cardiac Arrests, knowledge of cardiovascular disease and risk factors in a regional setting in India: The Warangal Area out-of-hospital Cardiac Arrest Registry (WACAR). *Indian Heart Journal*, 72(6), 517-523.
- Safranek, D. J., Eisenberg, M. S., & Larsen, M. P. (1992). The epidemiology of cardiac arrest in young adults. *Annals of emergency medicine*, 21(9), 1102-1106.
- Sakai-Bizmark, R., Friedlander, S. M., Marr, E. H., Mena, L. A., Corral, I., & Chang, R. K. R. (2018). Patient characteristics and emergency department factors associated with survival after sudden cardiac arrest in children and young adults: a cross-sectional analysis of a nationally representative sample, 2006–2013. *Pediatric Cardiology*, 39, 1216-1228.
- Yarmohammadi, H., Uy-Evanado, A., Reinier, K., Rusinaru, C., Chugh, H., Jui, J., & Chugh, S. S. (2017, October). Serum calcium and risk of sudden cardiac arrest in the general population. *Mayo Clinic Proceedings*, Vol. 92, No. 10, pp. 1479-1485.

