


Association of Coronary Risk Factors with BMI, Blood Pressure, and Diabetic Score in Football Factory Workers

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Disclaimers

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ABSTRACT

Background: Cardiovascular diseases are the leading cause of mortality worldwide. Occupational activities may influence coronary risk factors such as BMI, blood pressure, and diabetes, particularly among sedentary workers.

Objective: This study aimed to evaluate the association of coronary risk factors with BMI, blood pressure, and diabetes risk score among football factory workers.

Methods: A cross-sectional study was conducted among 102 football factory workers aged 40–55 years in Sialkot, Pakistan. Data were collected using the Physical Activity Readiness Questionnaire (PAR-Q), the Finnish Diabetes Risk Score (FINDRISC), and a coronary risk table proposed by the Michigan Heart Association. Descriptive and inferential statistics, including Pearson correlation, were performed using SPSS version 25.

Results: Among participants, 49.02% had high blood pressure, while 47.06% were overweight (BMI >24.5). Coronary risk was low (<5%) in 76.47% of workers, with 6.66% showing a high risk (>20%). Diabetes risk was low (<7 points) in 63.73% of workers. A weak positive correlation was observed between coronary risk and BMI ($r = 0.200$, $p = 0.044$), but correlations with blood pressure ($r = 0.075$, $p = 0.455$) and diabetes ($r = 0.104$, $p = 0.297$) were not statistically significant.

Conclusion: Football factory workers demonstrated minimal coronary risk due to their relatively healthy lifestyle. BMI was the most significantly associated factor among the measured variables.

INTRODUCTION

Cardiovascular diseases are among the most prevalent health conditions and the leading cause of mortality worldwide, although they are largely preventable (1). Coronary risk factors significantly contribute to morbidity and mortality, with approximately 70% of individuals at risk and only 2–3% remaining completely free of these risk factors (2). In Europe, nearly 50% of annual deaths are attributed to cardiovascular diseases, accounting for 42% in men and 51% in women (3). Globally, around 64 billion individuals suffer from cardiac failure, highlighting the substantial burden of this condition (4). Several risk factors, including hypertension, diabetes mellitus, dyslipidemia, high cholesterol, obesity, and increased BMI, contribute to the development of coronary artery diseases. Additional factors such as glucose intolerance, elevated coronary risk scores, and smoking further exacerbate the likelihood of cardiovascular conditions (5).

Hypertension is considered an independent risk factor for cardiovascular diseases, with a prevalence of 30–40% in various European countries (6). Elevated systolic blood pressure, even with normal or low diastolic pressure, is strongly associated with stroke risk, as demonstrated in the Framingham study (7, 8). Hypertension is linked to a sixfold increase in the risk of developing congestive heart failure and contributes to 40% of peripheral arterial disease, 25% of coronary vascular disease, and 50% of stroke cases (9, 10). Diabetes is another significant contributor to coronary

diseases, with higher mortality rates observed in diabetic individuals compared to their non-diabetic counterparts. Diabetes-related hyperglycemia and the duration of the condition further elevate cardiovascular risks (11). The Finnish Diabetes Risk Score is a validated tool used to identify undiagnosed type 2 diabetes and abnormal glucose tolerance (12).

The work environment of football factory workers is predominantly sedentary, involving prolonged periods of sitting or standing. Football stitching is carried out in factory-based, center-based, or home-based units, with working hours ranging from 7.5 to 9.1 hours per day over six-day weeks (13, 14). These workers face poor working conditions and inadequate physical activity, often accompanied by unhealthy dietary habits. Prolonged sedentary behavior and limited mobility heighten their risk of developing cardiovascular diseases (15). Monitoring the health status of these workers is essential, as they are exposed to several independent risk factors such as physical inactivity, obesity, and poor nutritional status. Addressing these risks is critical not only for improving their health but also for ensuring the sustainability and productivity of the football manufacturing industry. Despite extensive research on the football industry, including wages, manufacturing processes, and global value chains, limited attention has been given to the health status of workers, particularly the prevalence of coronary risk factors and their association with BMI, blood pressure, and diabetes.

This study aims to address this gap by evaluating the health risks of football factory workers. These individuals are particularly vulnerable due to their sedentary work environment and the cumulative effect of risk factors such as physical inactivity and unhealthy lifestyle choices. Understanding the association of coronary risk factors with BMI, blood pressure, and diabetes in this occupational group provides a foundation for targeted interventions to improve their health outcomes. The findings will inform strategies to mitigate these risks, ultimately benefiting both the workers and the industry.

MATERIAL AND METHODS

This cross-sectional study was conducted over six months, from March 18, 2023, to October 16, 2023, following ethical approval from the Allied Health Sciences Ethical Committee (IEC Ref. No. USKT/IEC/SPON.NON/352/09/2023, dated March 07, 2023). The study adhered to the principles outlined in the Declaration of Helsinki, ensuring the ethical conduct of research and the protection of participants' rights. Written informed consent was obtained from all participants before data collection.

The participants were recruited from various football factories in Sialkot, Pakistan, using a non-probability purposive sampling technique. The sample size was calculated using Raosoft software, resulting in a total of 102 participants. The inclusion criteria consisted of male football factory workers aged between 40 and 55 years, with a minimum of five years of work experience. Workers aged above 60 years or those with known pre-existing cardiovascular diseases were excluded from the study.

Data were collected using validated tools, including the Physical Activity Readiness Questionnaire (PAR-Q), the Finnish Diabetes Risk Score (FINDRISC), and the coronary risk table proposed by the Michigan Heart Association. The PAR-Q, a seven-question tool, assessed participants' readiness to engage in physical activity. The FINDRISC provided a quick assessment of type 2 diabetes risk based on eight measurable factors, including age, BMI, waist circumference, blood pressure, physical activity, dietary habits, history of hyperglycemia, and family history of diabetes. Blood pressure measurements were recorded using a standardized sphygmomanometer, and anthropometric data were obtained to calculate BMI. The coronary risk score was assessed using the Michigan Heart Association's standardized tool.

The collected data were analyzed using SPSS software, version 25. Descriptive statistics, including means, standard deviations, and percentages, were calculated to summarize the participants' demographic and clinical characteristics. Inferential statistical analysis included the Pearson correlation test to evaluate the association between coronary risk scores and variables such as BMI, blood pressure, and diabetes risk scores. Statistical significance was set at a p-value of less than 0.05.

The study was self-funded, ensuring independence in the design, data collection, and analysis processes. All ethical guidelines and protocols were rigorously followed to maintain the integrity and reliability of the findings.

Participants' anonymity and confidentiality were ensured throughout the study, and the data were securely stored to prevent unauthorized access.

RESULTS

In the conducted study, the assessment of coronary risk factors among football factory workers provided insightful results. Regarding blood pressure, as shown in Figure 1, 49.02% (n=50) of participants had high blood pressure (>120/80 mmHg), 34.31% (n=35) had blood pressure within the normal range (=120/80 mmHg), and 16.67% (n=17) had low blood pressure (<120/80 mmHg).

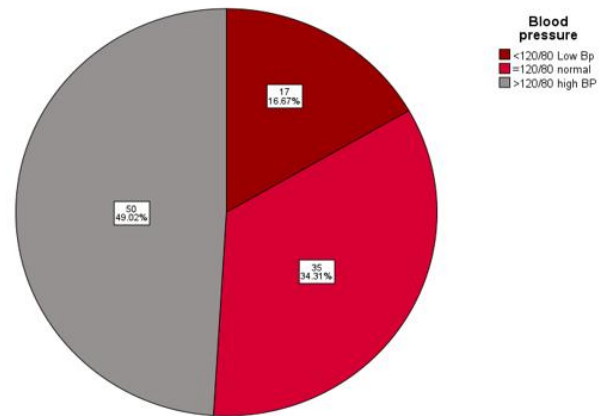


Figure 1: Blood Pressure Distribution

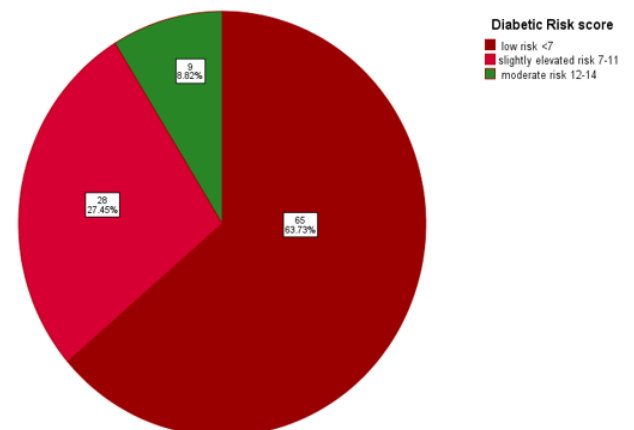


Figure 2: Finnish Diabetes Risk Score Distribution

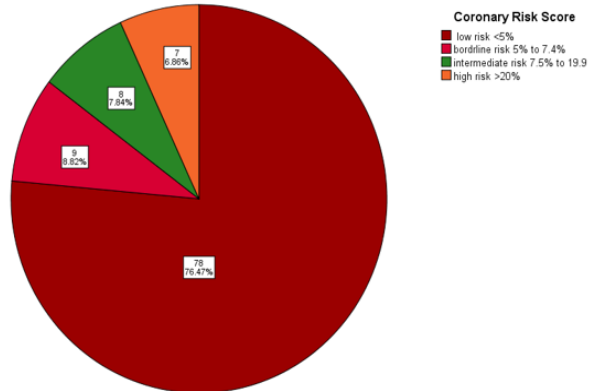


Figure 3: Coronary Risk Score Distribution

The Finnish Diabetes Risk Score, detailed in Figure 2, revealed that 63.73% (n=65) of participants had a low diabetes risk (<7 points), 27.45% (n=28) had a slightly elevated risk (7–11 points), and 8.82% (n=9) had a moderate

risk (12–14 points) for the development of diabetes. According to the coronary risk table scoring, proposed by the Michigan Heart Association (MHA), as shown in Figure 3, 76.47% (n=78) of participants had low coronary risk (<5%), 8.82% (n=9) had borderline risk (5–7.4%), 7.84% (n=8) had intermediate risk (7.5–19.9%), and 6.66% (n=7) had high coronary risk (>20%).

The study also analyzed the correlation between coronary risk score and BMI, blood pressure, and diabetes risk score,

as shown in Table 1. A weak, positive correlation was observed between coronary risk score and BMI ($r = 0.200$), which was statistically significant ($p = 0.044$). A weak, positive correlation was also found between coronary risk score and blood pressure ($r = 0.075$) and between coronary risk score and diabetes risk score ($r = 0.104$), but these relationships were not statistically significant ($p = 0.455$ and $p = 0.297$, respectively).

Table 1 Correlation of Coronary Risk Score (CRS) with BMI, Blood Pressure (BP), and Diabetes Risk Score (DRS)

Variables	BMI (r)	BMI (p-value)	BP (r)	BP (p-value)	DRS (r)	DRS (p-value)
CRS	0.200	0.044	0.075	0.455	0.104	0.297

DISCUSSION

The study provided a comprehensive evaluation of coronary risk factors and their association with blood pressure, BMI, and diabetes. It demonstrated that the association of coronary risk factors is stronger with BMI compared to blood pressure and diabetes. The majority of participants, approximately 47.1%, had a BMI greater than 24.5, indicating their sedentary lifestyle, which was similarly reported in a Brazilian study (16). The workers were engaged in static activities, such as cutting lamination sheets for about 8 hours or sitting and standing during other tasks involved in football manufacturing, including assembling the hexagonal cubes of footballs.

In football factories, long hours of sitting or standing duties increase the likelihood of workers developing a high risk of coronary diseases. These extended working hours make them less inclined to maintain a healthy diet or engage in physical activities. The study evaluated coronary risk scores using a coronary risk calculator, a standard tool for risk assessment. It revealed very low coronary risk among football factory workers in Sialkot, with 76.47% of the workers categorized as having low coronary risk. Since coronary risk is linked with physical activity, the varying levels of physical activity during work and leisure among these workers play a significant role. For instance, 36.27% of workers were stitchers who spent their entire working time sitting, which exceeds the working hours described in another study on health, fitness, physical activity, and morbidity among factory workers (17).

In this study, approximately 49.02% of participants had high blood pressure. However, in a similar study, about 27.8% of participants were hypertensive (18). High blood pressure was associated with increasing age, the prevalence of overweight individuals, and male gender compared to females. A higher BMI was observed in the majority of workers, approximately 47.06% of the total sample population (19). However, a similar study showed lower BMI in individuals engaged in socioeconomic activities. In this study, BMI was low in approximately 5.88% of workers. The elevated BMI in most workers was attributed to long working periods, inadequate dietary habits, and sleep deprivation, which ultimately led to higher BMI and obesity.

The study found that individuals with a high BMI are also at risk of developing diabetes, with a Pearson correlation of

0.104. A similar study conducted on Brazilian industry workers determined that workers with high BMI are at increased risk of developing type 2 diabetes in the future (20). This study evaluated the association of coronary risk scores with BMI, blood pressure, and diabetes, elaborating on the linkage between these risk factors. It included additional considerations such as smoking, fruit and vegetable intake, occupational settings, sedentary workplaces, and working hours.

The study concluded that introducing mechanization in factories could reduce the sedentary workload of laborers. Employers should prioritize workers' health by providing health insurance and implementing work breaks to mitigate the negative effects of prolonged sitting or standing. Additionally, factory owners should organize awareness workshops on healthy diets, the risks of smoking, and the importance of physical activity.

CONCLUSION

This study concluded that the investigated occupational category has minimal risk of cardiovascular illnesses due to their relatively healthy lifestyle. Coronary risk, evaluated in accordance with the MHA proposal, was low, reflecting the healthy status of the workers. Furthermore, the association of coronary risk with BMI, blood pressure, and diabetes was also found to be low. Overall, a weak positive correlation was observed between coronary risk and BMI, blood pressure, and diabetes.

REFERENCES

1. Abou Ghayda R, Park DD, Lee JY, Kim JY, Lee KH, Hong SH, et al. Body Mass Index and Mortality in Patients with Cardiovascular Disease: An Umbrella Review of Meta-Analyses.
2. Afshin A, Reitsma MB, Murray CJ. Health Effects of Overweight and Obesity in 195 Countries. *N Engl J Med*. 2017;377(15):1496–7.
3. Aung TN, Shirayama Y, Moolphate S, Lorga T, Jamnongprasatporn W, Yuasa M, et al. Prevalence and Risk Factors for Hypertension Among Myanmar Migrant Workers in Thailand. *Int J Environ Res Public Health*. 2022;19(6):3511.
4. Badr HE, Rao S, Manee F. Gender Differences in Quality of Life, Physical Activity, and Risk of Hypertension

- Among Sedentary Occupation Workers. *Qual Life Res.* 2021;30:1365–77.
5. Bennett DA, Du H, Bragg F, Guo Y, Wright N, Yang L, et al. Physical Activity, Sedentary Leisure-Time and Risk of Incident Type 2 Diabetes: A Prospective Study of 512,000 Chinese Adults. *BMJ Open Diabetes Res Care.* 2019;7(1).
 6. James SL, Abate D, Abate KH, Abay SM, Abbafati C, Abbasi N, et al. Global, Regional, and National Incidence, Prevalence, and Years Lived with Disability for 354 Diseases and Injuries for 195 Countries and Territories, 1990–2017: A Systematic Analysis for the Global Burden of Disease Study 2017. *Lancet.* 2018;392(10159):1789–858.
 7. Jamil S, Jamil G, Mesameh H, Qureshi A, AlKaabi J, Sharma C, et al. Risk Factor Comparison in Young Patients Presenting with Acute Coronary Syndrome with Atherosclerotic Coronary Artery Disease vs. Angiographically Normal Coronaries. *Int J Med Sci.* 2021;18(15):3526.
 8. Kakadiaris IA, Vrigkas M, Yen AA, Kuznetsova T, Budoff M, Naghavi M. Machine Learning Outperforms ACC/AHA CVD Risk Calculator in MESA. *J Am Heart Assoc.* 2018;7(22).
 9. Kannel WB. Role of Blood Pressure in Cardiovascular Morbidity and Mortality. *Prog Cardiovasc Dis.* 1974;17(1):5–24.
 10. Kannel WB, Castelli WP, McNamara PM, McKee PA, Feinleib M. Role of Blood Pressure in the Development of Congestive Heart Failure: The Framingham Study. *N Engl J Med.* 1972;287(16):781–7.
 11. Marks JB, Raskin P. Cardiovascular Risk in Diabetes: A Brief Review. *J Diabetes Complications.* 2000;14(2):108–15.
 12. Tammela T, Saaristo A, Lohela M, Morisada T, Tornberg J, Normén C, et al. Angiopoietin-1 Promotes Lymphatic Sprouting and Hyperplasia. *Blood.* 2005;105(12):4642–8.
 13. Malakar AK, Choudhury D, Halder B, Paul P, Uddin A, Chakraborty S. A Review on Coronary Artery Disease, Its Risk Factors, and Therapeutics. *J Cell Physiol.* 2019;234(10):16812–23.
 14. Lund-Thomsen P, Nadvi K, Chan A, Khara N, Xue H. Labour in Global Value Chains: Work Conditions in Football Manufacturing in China, India and Pakistan. *Dev Change.* 2012;43(6):1211–37.
 15. Khan FR, Lund-Thomsen P. CSR as Imperialism: Towards a Phenomenological Approach to CSR in the Developing World. *J Change Manag.* 2011;11(1):73–90.
 16. Wahid A, Manek N, Nichols M, Kelly P, Foster C, Webster P, et al. Quantifying the Association Between Physical Activity and Cardiovascular Disease and Diabetes: A Systematic Review and Meta-Analysis. *J Am Heart Assoc.* 2016;5(9).
 17. Tuxworth W, Nevill AM, White C, Jenkins C. Health, Fitness, Physical Activity, and Morbidity of Middle-Aged Male Factory Workers. *Occup Environ Med.* 1986;43(11):733–53.
 18. Aung N, Vargas JD, Yang C, Fung K, Sanghvi MM, Piechnik SK, et al. Genome-Wide Association Analysis Reveals Insights Into the Genetic Architecture of Right Ventricular Structure and Function. *Nat Genet.* 2022;54(6):783–91.
 19. Martinez MC, Latorre MD. Health and Work Ability Among Office Workers. *Rev Saude Publica.* 2006;40:851–8.