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STUDY OF ASSOCIATION BETWEEN BLOOD PRESSURE AND HANDGRIP STRENGTH IN LABOURERS

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Abstract

Background: This study delves into the association between blood pressure and handgrip strength among laborers aged 16-40 years in Parbhani, Maharashtra. It focuses on exploring the correlation between these two health indicators, considering the physical demands of labor-intensive occupations and their impact on cardiovascular health. **Methods:** In this cross-sectional study, 50 male laborers from Parbhani Medical College & Research Institute were assessed. Handgrip strength was measured using a Jamar Dynamometer, with blood pressure recorded simultaneously. The data were analyzed using Pearson's correlation coefficient to explore the relationship between the variables. **Results:** Our findings reveal a significant yet moderate correlation between systolic blood pressure and dominant hand grip strength, with a correlation coefficient of 0.3280. Diastolic blood pressure also demonstrated a positive correlation with handgrip strength. The results indicate a noteworthy relationship between muscular strength and cardiovascular health in laborers. **Conclusion:** The study highlights a significant association between handgrip strength and blood pressure among laborers, suggesting that enhanced physical fitness could positively impact blood pressure management in this demographic.

Keywords: Handgrip Strength, Blood Pressure, Laborers, Occupational Health, Cardiovascular Risk.

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Introduction

The intersection of occupational health and physical fitness presents a unique field of study, particularly in labor-intensive professions. This research focuses on exploring the association between blood pressure and hand grip strength among labourers. Hand grip strength is increasingly recognized as a key indicator of overall muscular health and has been linked to various health outcomes [1]. Additionally, the prevalence of blood pressure-related health issues in physically demanding occupations underscores the importance of this research [2].

Labourers, who frequently engage in strenuous physical activities, are at a heightened risk of cardiovascular diseases and other health complications [3]. This study is significant as it attempts to uncover potential correlations between hand grip strength and blood pressure in this group, which could have implications for occupational health policies and preventive healthcare measures [4].

The aim of this study is to assess whether there is a significant correlation between blood pressure levels and hand grip strength in labourers. This involves examining how hand grip strength varies across different blood pressure categories, including normotension, prehypertension, and hypertension, and exploring the influence of demographic and occupational factors [5].

International and national guidelines for prevention of hypertension recommend physical activity of moderate intensity for at least 150 minutes per week, or physical activity of vigorous intensity for 75 minutes per week.[6,7] The handgrip strength (HGS) is a fast and low-cost test used for evaluation of an individual's muscle strength.[8,9] It has been reported that isometric resistance exercise is an ideal and effective exercise method to reduce the blood pressure (BP) levels in individuals with normal and high BP.[10,11] The relationship between the HGS and blood pressure (BP) levels remains to be further elucidated.

There is a notable scarcity of research specifically investigating the interplay between blood pressure and hand grip strength among laborers, particularly within the age group of 16-40 years in Parbhani, Maharashtra. This gap in knowledge is especially significant considering the potential implications of these factors on the health and occupational performance of this demographic. Information on how blood pressure correlates with hand grip strength in this region is limited, underscoring the need for a targeted study in Parbhani.

Material and Methods

In our study, we sourced data from laborers aged 16 to 40 years who were employed at the campus of Parbhani Medical College & Research Institute. The research was carried out in the Department of Physiology at the same college, affiliated with RP Hospital & Research Institute. We adopted a cross-sectional study design for this research.

The participants for our study were selected through purposive sampling, focusing specifically on fifty male laborers within the 16-40 year age range. Our inclusion criteria were restricted to normal, healthy male laborers who were either right or left hand dominant. We excluded participants with work-related musculoskeletal disorders affecting the upper limb, those who were ambidextrous, had pain in the upper extremity, any restriction in the range of motion of the upper limb that could interfere with grip strength assessment, or had neuromuscular disorders or systemic pathologies affecting grip strength.

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For our research tools, we used a weighing scale to measure body weight and a stadiometer for body height. Hand grip strength was measured using a Hand Dynamometer. The grip strength of participants was assessed using a Jamar Dynamometer. The testing position, as recommended by the American Society of Hand Therapists, involved the participant seated with shoulders adducted in a neutral rotation, elbows flexed at 90 degrees, and forearms and wrists in a neutral position. The wrist's dorsiflexion was maintained between 0 and 30 degrees, and ulnar deviation between 0 and 15 degrees. Participants were asked to exert maximum force in a single effort, and this test was conducted three times for each hand, alternating between hands with a 15-second rest between trials. We recorded the average of the three trials for both hands in kilograms, ensuring that the dynamometer was recalibrated to zero after each test.[12]

For data analysis, we used Microsoft Excel 2021. We calculated the mean and standard deviation for variables such as age, height, and weight. Furthermore, to analyze the relationship between the variables, Pearson's correlation coefficient was employed.

Results

In the results section of our study, we begin by presenting the descriptive statistics of the participants' demographic and physiological measures. This includes age, height, weight, pulse rate, and blood pressure. These data provide a foundational understanding of the physical characteristics of our sample group, which is essential for contextualizing the subsequent analyses. We then delve into the heart of our study, exploring the correlations between hand grip strength and blood pressure, aiming to unravel the complexities of these relationships in our specific demographic of young and middle-aged laborers.

Table 1: Descriptive statistics of variables

	Mean	**Standard Error**	**Standard Deviation**	**Variance**	**Range**	**Confidence Level (95.0%)**
Age	27.44	1.18	8.33	69.31	30.00	2.37
Height	163.58	0.83	5.85	34.25	23.00	1.66
Weight	56.90	1.45	10.26	105.31	36.20	2.92
Pulse	80.98	1.17	8.25	68.06	28.00	2.34
Systolic BP	125.16	1.68	11.88	141.08	42.00	3.38
Diastolic BP	83.24	1.26	8.92	79.66	32.00	2.54
Mean Arterial Pressure	97.21	1.37	9.66	93.24	34.67	2.74

Table 2: Pearson's Correlation of dominant and Non-dominant hand grip strength with Blood pressure

	Correlation coefficient	**R square**	**Standard error**
Systolic Blood pressure dominant Hand Grip	0.3280	0.1076	11.3366
Systolic Blood pressure Non	0.1933	0.0374	11.7744

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dominant Hand Grip			
Diastolic Blood pressure dominant Hand Grip	0.2962	0.0878	8.6127
Diastolic Blood pressure Non dominant Hand Grip	0.2068	0.0428	8.8225

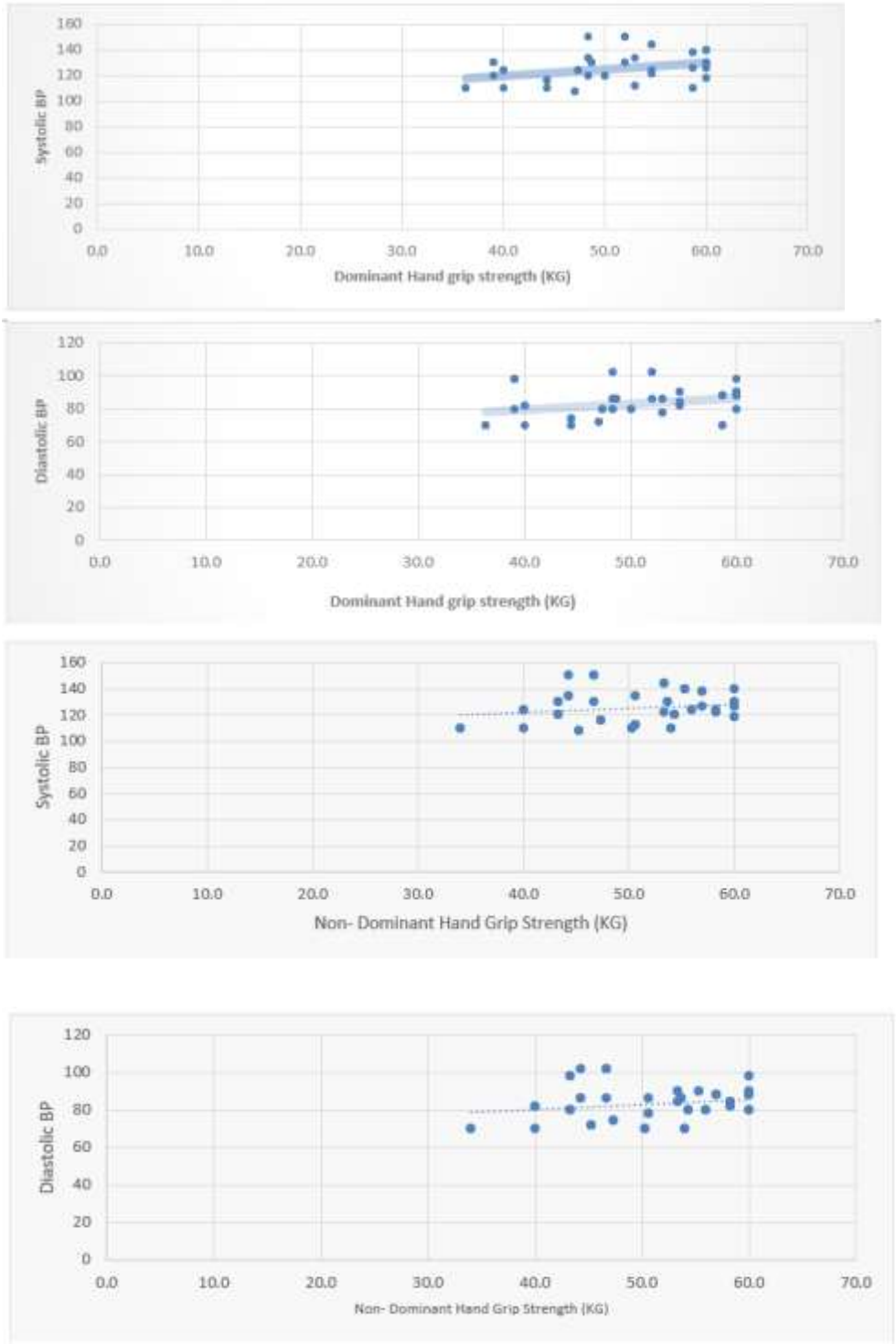

Figure 1: Scatter diagram showing correlation of dominant and Non-dominant hand grip strength with Blood pressure

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Table 1 presents the descriptive statistics of the study's variables. Specifically, the average age of the participants is 27.44 years with a standard deviation (SD) of 8.33, indicating some variability in the age group. The height and weight of the participants have averages of 163.58 cm (SD = 5.85) and 56.90 kg (SD = 10.26) respectively. Regarding blood pressure, the mean systolic blood pressure is observed at 125.16 mmHg (SD = 11.88), and the diastolic blood pressure is at 83.24 mmHg (SD = 8.92). The mean arterial pressure, a crucial indicator of overall blood pressure health, stands at 97.21 mmHg (SD = 9.66).

In Table 2, Pearson's correlation analysis reveals the relationship between hand grip strength and blood pressure. The correlation between systolic blood pressure and dominant hand grip strength is modest but significant at 0.3280, explaining about 10.76% of the variance (R square = 0.1076). For the non-dominant hand, the correlation with systolic blood pressure is weaker at 0.1933 (R square = 0.0374). In terms of diastolic blood pressure, the correlation with dominant hand grip strength is 0.2962 (R square = 0.0878), and for the non-dominant hand, it's 0.2068 (R square = 0.0428). These findings suggest a more pronounced relationship between systolic blood pressure and grip strength compared to diastolic pressure.

Discussion

In our study's discussion, we integrate findings from various research papers to provide a comprehensive understanding of the relationship between handgrip strength, blood pressure, and BMI. Dong *et al.* (2016)[13] found an association between increased BMI, elevated blood pressure, and lower grip strength in a large sample of Chinese adolescents, showing that stronger grip strength correlates with increased blood pressure when BMI is adjusted. Mallah *et al.* (2019)[14] observed a positive correlation between handgrip strength and diastolic blood pressure in a rural Chinese population. Dhananjaya *et al.*[15] reported a significant correlation between BMI and handgrip endurance, with a notable negative correlation between BMI and grip strength in normal BMI male participants and a weak negative correlation in obese males. Ji *et al.* (2018)[16] found a positive relationship between handgrip strength and blood pressure, indicating a higher risk of hypertension in overweight or obese men. Lastly, Salim and Davy (2023)[18] reported a significant negative correlation between BMI and handgrip strength in young adults, alongside a positive correlation between BMI and systolic and diastolic blood pressure. These findings collectively underscore the intricate connections between BMI, blood pressure, and muscle strength, supporting the patterns observed in our study among laborers in Parbhani, Maharashtra.

Conclusion

In conclusion, our study reveals a notable correlation between hand grip strength, blood pressure, and BMI among laborers aged 16-40 in Parbhani, Maharashtra. We observed that higher BMI is associated with lower grip strength and elevated blood pressure, underlining the importance of physical fitness in this demographic. However, our study has limitations, including a small sample size and a focus on a specific region, which may affect the generalizability of the results. Future research should consider larger, more diverse populations and explore the longitudinal impact of these variables.

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