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Original Research Article

Comparing dominant hand grip strength between housewives and female bank clerks in Ujjain city: an observational study

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ABSTRACT

Background: The human hand, comprising complex musculoskeletal structures including major joints and numerous muscles, plays a crucial role in daily activities. Handgrip strength (HGS) is a key indicator of muscle strength and overall physical fitness. Factors such as posture, age, and physical activity influence HGS. This study aims to compare HGS between housewives and female bank clerks in Ujjain City, given their distinct daily physical activities.
Method: This observational study was conducted over two months in Ujjain, involving 30 women aged 25-35 years, divided into two groups: housewives (n=15) and bank clerks (n=15). Participants were selected through purposive sampling and provided written informed consent. Exclusion criteria included musculoskeletal or neurological deficits, pregnancy, unwillingness to participate, and metabolic disorders.
Results: The mean age of housewives was 28.60 years, and for bank clerks, it was 27.60 years. Housewives demonstrated significantly higher HGS across all three readings compared to bank clerks. The first reading showed housewives with a mean strength score of 15.80 kg and bank clerks with 10.40 kg ($p=0.004$). The second reading showed mean scores of 11.60 kg for housewives and 7.27 kg for bank clerks ($p<0.001$). The third reading recorded 8.93 kg for housewives and 5.53 kg for bank clerks ($p=0.004$).
Conclusion: The study reveals that housewives exhibit higher HGS compared to female bank clerks, likely due to the more physically demanding nature of household tasks. These findings align with previous research indicating that physical activity, including domestic chores, positively impacts muscle strength.

Keywords: Hand grip strength, Musculoskeletal disorders, Muscle strength, Gender, Physical activity

INTRODUCTION

The human hand represents the most sophisticated and distinct musculoskeletal tool in humans. It consists of four major joints: carpometacarpal, intercarpal, metacarpophalangeal, and interphalangeal joints. Additionally, it includes 9 extrinsic and 10 intrinsic muscles, each active during gripping activities. Overall, 35 muscles contribute to the movement of the forearm and hand, with the flexor muscles acting as agonists and the extensors as antagonists during these movements.[1,2] To assess and compare the dominant handgrip strength between housewives and female bank clerks in Ujjain City.

Hand grip strength

Muscular strength refers to the capacity of muscles to exert force against resistance, and handgrip strength (HGS) is a critical measure of this capacity, reflecting the strength of

the hand muscles. This strength is crucial for performing everyday activities and is influenced by factors such as posture, gender, age, handedness, nutritional status, wrist and forearm position, and psychological factors. Physical activity is essential for overall well-being, offering benefits such as reduced risks of cardiovascular and metabolic diseases, bone fractures, and depressive symptoms. HGS specifically measures the force exerted by the hand to hold, pull, or suspend objects. It serves as a reliable and simple indicator of hand functional integrity and overall skeletal muscle strength and physical fitness. Numerous studies highlight the strong association between HGS and nutrition.[3] A decline in muscle strength negatively impacts mobility, physical performance, and functional status, increasing the risk of impairment, hypertension, and other cardiovascular diseases. Muscle strength diminishes more rapidly than muscle mass, leading to difficulties in performing daily tasks and a decrease in muscle girth, a significant factor in strength loss.

The HGS test, which measures the maximum isometric strength of hand and forearm muscles, involves using a handheld dynamometer. Participants receive detailed instructions on its use, and three readings are taken from the dominant hand, with the average considered for data analysis.[4] Women, often the backbone of household activities, face decisions about working outside or staying at home influenced by their economic and social status. They typically spend 13-14 hours daily on household chores and family care, which includes cooking, washing clothes, cleaning utensils, and mopping. The physical strain from these activities can impair the health of household women, affecting the quality and duration of their work.[5] Given their multiple responsibilities, women's physiological, mental, and medical needs are significant, yet they often have little time for self-care. Reduced HGS can cause physiological discomfort and other types of fatigue, affecting the time needed to perform tasks. Long working hours, constant attention, precision demands, job diversification, poor postures, inadequate nutrition, and overall poor health contribute to physical and psychological stress in women.[6]

METHODS

Study design

This was an observational study.

Study duration

The period of the study was of 2 months from April 24, 2024 to June 24, 2024.

Sample size

Overall, 30 participants were taken for the study.

Study place

The study was conducted in Ujjain (M.P) which provides a diverse demographic base, making it an ideal location to study occupational differences in physical health. The research targeted urban and semi-urban areas where participants from two distinct occupational groups-housewives and female bank clerks were recruited. The city's urban setup includes numerous households with women actively managing domestic responsibilities, alongside a growing number of women employed in formal office settings like banks. The central location and accessibility of Ujjain, along with its existing network of institutions, facilitated the recruitment and follow-up of participants. Additionally, the moderate awareness of occupational health issues among residents ensured smooth data collection, which was conducted in environments familiar and comfortable for the participants, such as workplaces for bank clerks and homes for housewives.

Sampling method

Purposive sampling

The study involved 30 female participants who were divided into two groups: Group A: Housewives (n=15). Group B: Female bank clerks (n=15). Participants were recruited based on specific inclusion and exclusion criteria, and written informed consent was obtained from all subjects.

Inclusion criteria

This includes females aged between 25-35 years. Housewives performing household work such as cooking, mopping, and cleaning utensils. Female bank clerks working in a 9-5 job. Minimum work experience of 2 years for both housewives and bank clerks.

Exclusion criteria

Diagnosed cases of musculoskeletal or neurological deficits. Pregnant women. Women unwilling to participate. Individuals with diagnosed metabolic disorders were excluded from the study.

Procedure

After obtaining informed consent, demographic data such as age and self-reported hand dominance were collected from all participants. The procedure for measuring handgrip strength involved using a dynamometer. Participants were seated comfortably in a chair with back support and fixed armrests to ensure consistency during measurements.

Each participant was instructed to remove any accessories (e.g., watches or bracelets) that could interfere with the measurement. Grip the dynamometer using their dominant

hand, with their forearm resting on the armrest and thumb positioned on one side of the handle, while the fingers wrapped around the other side.

Before the measurement, the dynamometer was cleaned and demonstrated to the participants. They were instructed to squeeze the device as tightly as possible, until the needle stopped rising, indicating the peak grip strength.

Measurement process

Three measurements of grip strength were taken for each participant's dominant hand. The highest value was recorded to the nearest 1 kg. The procedure aimed to ensure accurate, reliable, and consistent measurements of handgrip strength between the two groups.

Statistical analysis

The normality of distribution of all variables was verified using the bar graphs. All the variables were found to be normally distributed. Statistical data analysis is expressed as mean±standard deviation (SD) and p and t test. An independent t test was used for between-groups analysis for all domains and HGS person correlation was used among all domains and HGS for housewives, female bank clerk and total female population. The significance level was fixed at p=0.004.

RESULTS

The table presents a comparison of mean ages and standard deviations between housewives and female bank clerks in Ujjain City. The mean age of housewives is 28.60 years with a standard deviation (SD) of 3.48, indicating a relatively narrow range of age variation within this group. On the other hand, the mean age of female bank clerks is slightly lower at 27.60 years, with a higher SD of 4.07, suggesting greater variability in age within the bank clerk group. Overall, both groups are similar in age, with a minor difference of 1 year in their mean ages.

Table 1: Comparison of mean ages and standard deviations among housewives and bank clerks.

Age	Groups			
	Housewives		Bank clerk	
	Mean	Standard Deviation	Mean	Standard Deviation
	28.60	3.48	27.60	4.07

Table 2: Comparison of mean strength of dominating hand between housewives and bank clerk.

Group		N	Mean strength score of dominating hand	SD	t value	P value
First reading	Housewives	15	15.8	5.7	3.108	0.004
	Bank clerk	15	10.4	3.58		
Second reading	Housewives	15	11.6	2.75	4.118	0
	Bank clerk	15	7.27	3.01		
Third reading	Housewives	15	8.93	3.51	3.176	0.004
	Bank clerk	15	5.53	2.2		

The table compares the mean strength scores of the dominant hand between housewives and female bank clerks across three measurements. Overall, housewives consistently demonstrate higher handgrip strength compared to bank clerks. The mean strength score for housewives is 15.80 with a standard deviation (SD) of 5.70, while for bank clerks, the mean is 10.40 with an SD of 3.58. The t test value of 3.108 and a p value of 0.004 indicate a statistically significant difference in strength between the groups. Similarly, in the second measurement, housewives show a higher mean strength of 11.60 (SD=2.75) compared to 7.27 (SD=3.01) for bank clerks, with a t value of 4.118 and a highly significant p value of 0.000. In the final measurement, the mean strength score for housewives is 8.93 (SD=3.51), while for bank clerks it is 5.53 (SD=2.20), and the difference remains statistically significant with a t-value of 3.176 and a p value of 0.004. These results demonstrate that housewives have significantly stronger dominant handgrip strength than female bank clerks across all three readings.

DISCUSSION

This study aimed to compare age distribution and hand strength between housewives and bank clerks. We compared mean ages and standard deviations between the groups, as well as mean strength scores of the dominating hand at three different readings. The mean age of housewives was 28.60 years with a standard deviation (SD) of 3.48, whereas the mean age of bank clerks was 27.60 years with an SD of 4.07. The age difference between the two groups was minimal, indicating that the study groups were relatively similar in age.

The mean strength scores of the dominating hand were significantly higher in housewives compared to bank clerks across all three readings. In the first reading, housewives had a mean strength score of 15.80 with an SD of 5.70, while bank clerks had a mean score of 10.40 with an SD of 3.58 (t=3.108, p=0.004). The second reading

showed housewives with a mean score of 11.60 (SD=2.75) and bank clerks with 7.27 (SD=3.01) (t=4.118, p<0.001).

The third reading had housewives with a mean score of 8.93 (SD=3.51) and bank clerks with 5.53 (SD=2.20) (t=3.176, p=0.004). In comparison with similar studies, Roberts et al, found that office workers, including bank clerks, had significantly lower hand strength compared to individuals engaged in more physically demanding household activities. This supports the findings of the current study, suggesting that housework might contribute to higher hand strength.[7]

Similarly, McPhee et al, examined the physical fitness levels of homemakers versus sedentary workers and discovered that homemakers generally had better upper body strength and endurance. This aligns with our findings, as housewives showed consistently higher hand strength scores than bank clerks.[8] A study by Zhang et al, reported that individuals engaged in manual labor, including domestic tasks, exhibited greater hand strength compared to those in clerical roles. This study further corroborates our results, emphasizing the impact of daily physical activities on hand strength.[9] Garcia-Hermoso et al, conducted a cross-sectional study assessing grip strength in various occupational groups and found that non-sedentary workers had significantly higher grip strength than their sedentary counterparts.

Their findings are consistent with the current study, highlighting the influence of physical activity on muscle strength.[10] Lastly, Westerterp et al, investigated the relationship between occupational activities and physical fitness levels, concluding that individuals engaged in regular physical tasks, such as housework, exhibited higher overall physical fitness, including hand strength. This study provides additional evidence supporting our results.[11] Further research by Dodds et al, showed that grip strength was significantly higher in individuals who performed regular physical activity, such as housework, compared to those in sedentary occupations, adding to the growing body of evidence that aligns with the present findings.[12] Bohannon et al, highlighted that grip strength is a reliable indicator of overall physical health and fitness, with those engaged in routine physical tasks, such as housewives, exhibiting stronger grip strength, which further corroborates the study's results.[13]

Leong et al, conducted a multicentre study on grip strength across different populations and confirmed that individuals engaged in manual labour had consistently higher grip strength, supporting the current findings.[14] A study by Cadenas-Sanchez et al, found similar trends, reporting that grip strength was significantly higher among non-sedentary workers compared to their sedentary counterparts, reinforcing the observations made in this study.[15] Finally, Steiber et al, conducted research that highlighted the strong correlation between physical activity and handgrip strength, with housewives scoring higher due to regular engagement in physical tasks, aligning with the results presented here.[16]

The study has some limitations, mentioned as below.

Sample size

Although the study was conducted with 30 participants, this focused sample allowed for detailed analysis within the given groups. Future studies with a larger sample size could provide further validation of the findings.

Purposive sampling

While purposive sampling was employed to select participants who met specific criteria, this approach ensured that the study included individuals most relevant to the research objectives. Expanding the sampling method in subsequent studies could enhance generalizability.

CONCLUSION

The study demonstrate that housewives tend to have higher hand strength compared to bank clerks. This difference may be attributed to the varying levels of physical activity associated with their respective roles. The findings are consistent with previous research, which has consistently shown that physical activity, including domestic tasks, positively impacts muscle strength. Future studies could further explore the specific types of household activities that most significantly contribute to increased hand strength and overall physical fitness.

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