

Analysis of Hand Anthropometry of the People of Different Nations Working in Bangladesh

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Abstract

People of various nationalities are living in Bangladesh for various occupational purposes because of increasing of communication and globalization. This research was performed on the hand anthropometry of people (both male and female) of various professions and nationalities living in Bangladesh. A database of mean and standard deviation of eight anthropometric dimensions of hands was evaluated for Bangladeshi, Indian, Sri Lankan and African workers. The analysis was performed on 200 workers (50 workers for each nationality) where their age range was 25 years to 40 years to find out the variation in their mean and standard deviation values. These values can be utilized further for analyzing, designing and machining of hand tools and equipment based on the anthropometric dimensions

Keywords

Anthropometry, Dimensions, Nationalities, Occupation and Hand tools.

1. Introduction

Many foreign workers as well as Bangladeshi workers are contributing a major lot to various types of fields. This research was done to find out the differences in various dimensions of hand anthropometry, mean and standard deviation value of people from various nations and also from Bangladesh. By learning from the study, many hand tools can be redesigned or newly designed using the data so that they may not face any disorders in their work place. The main aim of the research study is to find out the differences of the mean and standard deviation values of hand anthropometry among people of various nationalities. The values can be used in future to design various types of tools that would suit all types of people living in our country.

2. Literature Review

Analysis of hand anthropometry was found in various researches. Hand anthropometry for various handheld devices as well as grip curvature effect was discussed in a certain work (Ahn et al., 2016). In another work hand anthropometric dimensions were taken from Bangladeshi population and from the measurements of hands, stature of Bangladeshi population was estimated (Asadujjaman et al., 2019). Similarly, stature was determined from hand length and breadth and the research was done on Kashmiri population (Khan et al., 2017; Talapatra & Uddin, 2017).

A survey was done on dentistry students for determining the hand anthropometry of the students and also for taking biomechanical measurements (Cakit et al., 2014). Similar research work was done on Chinese female living in Hong Kong and the determined hand anthropometry of the population was compared with other groups to find out the deviation (Coutney 1984). Another similar research of determining hand anthropometry was found to be done on manufacturing and industrial workers living in Philippine (Del Prado-Lu, 2007; Talapatra & Uddin, 2018a).

Another study was performed on male population of Bangladesh. Hand anthropometric dimensions were taken from the workers (Imrhan et al., 2006). In the same way, hand anthropometric survey was done on Jordanian population (Mandahawi et al., 2008) as well as on Indian women population (Nag et al., 2003). Jee and Yun (2016) conducted a survey to determine hand shapes and size of people living in Korea. According to a research work (Kaya et al., 2003), a new approach was estimated for measuring anthropometric dimensions by a system called neuro-fuzzy approach system.

Various hand anthropometric dimensions of farm workers living in villages of north east Nigeria were taken and evaluated in a research study (Obi 2016). Additional research was performed to estimate or consider the importance of anthropometry for designing the working environment for the persons who are disable (Nowak 1996; Talapatra & Uddin, 2018b). A survey-based research work was found to be done on Bangladeshi agricultural workers where hand anthropometry of the farm workers was determined (Shahriar et al., 2020). For determining hand anthropometric dimensions for Thai female population similar survey was performed in a study (Saengchaiya and Bunterngrchit, 2004). In a research study, it was pointed out that there are ethnic variations in Indonesian hand anthropometric values and the variation was taken from collecting evidence from three largest ethnic groups (Widyanti et al., 2015).

3. Methods

Data was collected and collected data was analyzed for four nationalities of workers were performed for the purpose of the research.

3.1 Data Collection

The research work was done among four nationalities of industrial workers living in Bangladesh such as Bangladeshi, Indian, Sri Lankan and African workers. 200 male and female workers were taken as sample size where the age range was 25 to 40 years old. Each category of participant consisted of 50 workers where 25 workers were male and 25 workers were female. The participants were from Dhaka, Chittagong and Khulna. All the dimensions were taken using slide calipers, meter scale, tape and anthropometer. The dimensions were taken twice to avoid any kind of error. The participants spontaneously took part for the survey. The socio demographic feature of the workers was shown in Table 3.1

Table 3.1: Socio demographic features or characteristics of the workers

Nationalities	Sample Size	Age Range	Occupation	Living Area
Bangladeshi	50 (Male=25 Female=25)	25-40	Industry Workers	Dhaka, Chittagong and Khulna
Indian	50 (Male=25 Female=25)			
Sri Lankan	50 (Male=25 Female=25)			
African	50 (Male=25 Female=25)			

3.2 Analysis of Data

From the survey it was found that eight dimensions are necessary for evaluating the existing hand tools in the industry. For this reason, the dimensions length of hand, length of palm, length of fist, length of hand grip, breadth of hand grip, breadth of hand with thumb, depth of hand at thumb base and fist circumference were taken for 200 (both male and female) industrial workers including Bangladeshi, Indian, Sri Lankan and African. From the dimensions, mean and standard deviation values were evaluated for each nationality of male and female workers. Also combined mean and standard deviation value was determined to find out the overall deviation in the mean and standard deviation values among four nationalities of workers. Table 3.2 shows the mean and standard deviation values for Bangladeshi, Indian, Sri Lankan and African workers (male, female and combined).

Table 3.2: Mean and standard deviation for Bangladeshi and Indian male and female workers

Dimensions	Gender	Bangladeshi Worker		Indian Worker	
		Mean	Standard Deviation	Mean	Standard Deviation
Length of Hand	Male	180.75	11.54	181.45	11.98
	Female	176.22	9.67	176.32	10.39
	Both	178.48	10.60	178.88	10.53
Length of Palm	Male	103.96	7.78	103.98	7.31
	Female	96.78	5.98	96.47	5.78
	Both	99.71	6.71	100.23	6.55
Length of Fist	Male	102.11	10.11	101.67	10.89
	Female	97.23	12.93	98.52	12.98
	Both	99.67	11.52	100.09	11.94
Length of Hand Grip	Male	50.74	7.98	52.23	8.76
	Female	50.62	7.32	51.65	7.34
	Both	50.68	7.65	51.94	8.05
Breadth of Hand Grip	Male	99.12	9.21	99.98	9.85
	Female	87.21	8.59	87.78	8.93
	Both	93.16	8.89	93.88	9.39
Breadth of Hand with Thumb	Male	97.21	6.98	97.98	7.56
	Female	82.98	6.45	82.43	6.21
	Both	90.09	6.71	90.21	6.88
Depth of Hand at Thumb Base	Male	43.45	5.32	42.23	4.92
	Female	41.87	4.87	40.56	3.76
	Both	42.66	5.11	41.39	4.34
Circumference of Fist	Male	264.11	18.65	262.16	16.34
	Female	223.21	12.98	224.34	13.56
	Both	243.66	15.81	243.22	14.95

Dimensions	Gender	Sri Lankan Worker		African Worker	
		Mean	Standard Deviation	Mean	Standard Deviation
Length of Hand	Male	179.34	10.11	185.76	14.78
	Female	177.45	9.32	182.23	12.37
	Both	178.37	9.72	183.99	13.57
Length of Palm	Male	102.93	7.11	108.56	10.45
	Female	95.34	5.12	104.78	9.89
	Both	99.13	6.12	106.67	10.12
Length of Fist	Male	102.98	10.67	109.56	14.78
	Female	97.34	11.89	104.36	13.89
	Both	100.16	11.09	106.97	14.34
Length of Hand Grip	Male	51.56	7.32	56.49	10.56
	Female	50.89	6.87	54.98	9.65
	Both	51.22	7.09	55.74	10.11
Breadth of Hand Grip	Male	98.17	8.45	103.89	13.87
	Female	86.45	8.32	95.45	10.56
	Both	92.31	8.38	99.67	12.22
Breadth of Hand with Thumb	Male	96.22	6.91	109.67	11.67
	Female	81.91	6.21	106.54	7.53
	Both	88.79	6.46	108.11	9.62
Depth of Hand at Thumb Base	Male	43.48	5.57	47.98	9.65
	Female	41.21	4.89	44.32	8.67
	Both	42.34	5.34	46.15	8.02
Circumference of Fist	Male	263.14	17.69	271.87	22.75
	Female	229.67	13.67	265.54	19.65
	Both	246.41	15.68	268.72	21.2

4. Results and Discussion

Variation of standard deviation and mean among Bangladeshi workers, Indian workers, Sri Lankan workers and African workers can easily be understood from data analysis. The variation among mean values and standard deviation values are presented through graphical analysis. Figure 4.1 and Figure 4.2 show comparison of mean values and standard deviation values for Bangladeshi, Indian, Sri Lankan and African workers.

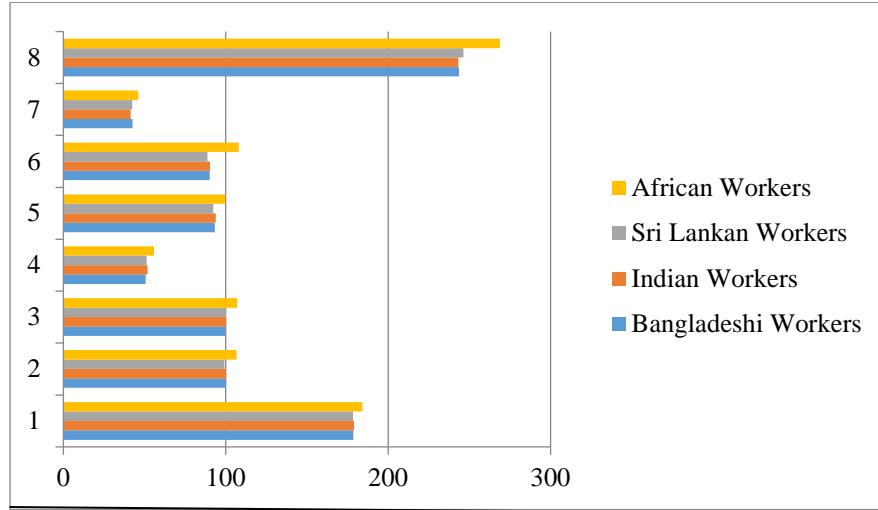


Figure 4.1: Comparison of mean among workers of different nationalities

From figure 4.1, it was found that the mean variation for both male and female workers (combined) of Bangladeshi workers, Indian workers and Sri Lankan workers is low. But the mean values for eight dimensions of African workers are higher than the previous mentioned three nationalities of workers. That's the reason, the deviation of mean values for African workers is higher than those of Bangladeshi, Indian and Sri Lankan workers.

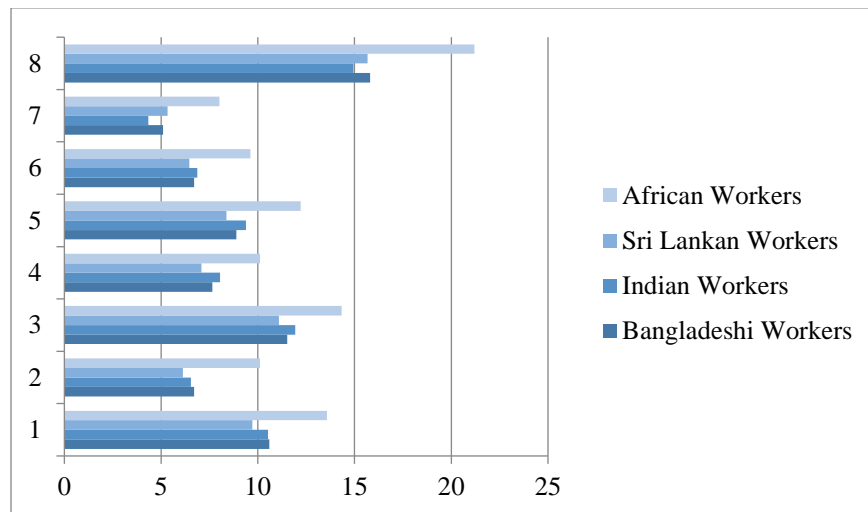


Figure 4.2: Comparison of standard deviation among workers of different nationalities

From figure 4.2, it was found that the difference in standard deviation for both male and female workers (combined) of Bangladeshi workers, Indian workers and Sri Lankan workers is low. But the standard deviation values for eight dimensions of African workers are higher than the previous mentioned three nationalities of workers. That's the

reason, the variation for standard deviation value for African workers is higher than those of Bangladeshi, Indian and Sri Lankan workers.

So it can be said that there is similarity on different dimensions of hands among Bangladeshi, Indian and Sri Lankan people. But there is noteworthy contrast for the similar dimensions of hands for African people with Bangladeshi, Indian and Sri Lankan people.

5. Conclusion

To conclude because of globalization, people of many countries are contributing to our economy by working in various industries. In industries, they use various hand tools. In this research 200 workers, both male and female were taken as participants for the analysis. Eight anthropometric dimensions were evaluated by measuring mean and standard deviation of Bangladeshi, Indian, Sri Lankan and African workers. It was found that the deviation in values was low for Bangladeshi, Indian and Sri Lankan workers. But for African workers the deviation is higher with other nationalities. These values can be considered for further research and design that will fit for every nationality of workers living in Bangladesh.

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