



## Anthropometric Measurement for Bangladeshi Manual Wheelchair Users: A cross Sectional Survey

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### Abstract

**Background:** Anthropometry is the area of science which measures abilities of a person and different physical characteristics of a person. Anthropometry provides essential information's for designing an appropriate occupational or non-occupational environment. Designing an appropriate occupational environment is most important for peoples specially persons who use wheelchair as the medium of their mobility. Wheelchair users need some special consideration in their working environment. Anthropometrical measurement of wheelchair users is a must for designing an optimum occupational environment for wheelchair users.

**Aim:** To determine the anthropometric measurement of the Bangladeshi manual wheel chair users.

**Method and Materials:** A cross sectional survey using convenient sampling process was carried out among Bangladeshi male and female manual wheelchair users to find out the aims and objective of this research. This study was conducted in Centre for the Rehabilitation of the Paralyzed (CRP), Savar, Dhaka, Bangladesh.

**Result:** From the measurements obtained, it can be said that in each of these measures was observed that men have larger dimensions than women, except for body depth, in which women had a slightly greater difference. When comparing the data in this study against other studies it shows that there is a significant difference between the averages of these studies.

**Conclusion:** Anthropometric data obtained through this study appear to be the only of this kind in Bangladesh for manual wheelchair users. The use of these data may be helpful for the proper design of workstations design for wheelchair users and also can be a base for further study in this field.

**Key Words:** Anthropometry; Manual Wheelchair; Body dimension

### Background

The word "Anthropometry" is derived from two Greek words. Greek word "anthropo" means "human" and "metron" means "measure" (Ulajaszek 1994). Anthropometry is the area of science, which measures abilities of a person and different physical characteristics of a person. To make a well fitted wheel chair, applied ergonomics and anthropometric data is very important. Ergonomics is totally related to

work and comfort. Ergonomics uses data regarding people, their physical and cognitive skills, and limits, including their body sizes, height, weight and their ability to work in the extreme temperatures. The possible impact of not using applicable wheelchair include the development of pain related problems like back pains, system disorders, pressure sores, rheumatic pains and other work related musculoskeletal disorders (Ashiedu 2013,



p.133). Anthropometric data are also used to evaluate health and dietary status, disease risk, and body composition changes that occur over the adult.

Anthropometric data is used to ensure standard and realistic ergonomic applications (University 2014). Peoples using wheelchair as their mobility device have to cope not only with their impairments but also with their device. Peoples using wheelchair has some anthropometric disadvantages from being anywhere from 10 to 18 inches lower than other adult in a situation where standing is needed (Jacobs 2008). Designing for people with disabilities using the standard anthropometric measurement and techniques is difficult, because of their high degree of statistical variability among this group of people (Jacobs 2008). Types of disability remarkably affect the distributions of body dimensions.

Body dimension provides the basis of building up model or suggested list of required data for measuring human body. Any incorporation among human anthropometric dimension, environmental dimension and equipment dimension leads to decreased productivity, injuries, muscular disorders, psychological distress, depression etc. (Regulation 2014).

Wheelchair users have to do all their works within the wheelchair and thus coordination with the chair is a must. For creating a fine coordination and to fit the chair within the physical capability of the disable person, it is very necessary to measure the anthropometrical characteristics that can help him/her for a better performance in the activities of daily living (Jarosz 1996, p.128). The lack of anthropometric information for wheelchair users severely limits their ability to design environments and products that are functional by as many as feasibly possible, as wheelchair

users usually need to perform daily and skilled activities completely in their wheelchairs (Lee 2007, p.98). For the design of a universally accessible industrial workstation, accurate structural anthropometric measurements for both able-bodied individuals and wheelchair mobile adults are required (Das & Kozey 1999, p.395). Anthropometric measurement is influenced by gender, ethnicity & age (Akhter 2009, p.1).

In the south Asian region, there is an increasing rate of manual wheel chair users. In a statistic, it has been found that there are eight million potential wheelchair users in India (DRRI, 2006). From a survey conducted by Handicap International It has been estimated that the prevalence of people with disabilities in Bangladesh, ranging from 0.5% to 14.04% (Handicap International Bangladesh and NFOWD 2005). Another study conducted in 2005 estimated that about 9.7 % of the disable people are disabled by Polio (Titumir and Hossain 2005). Guillain–Barré syndrome (GBS), is the most frequent cause of acute flaccid paralysis (AFP) (Islam et al. 2011). About 2.9 % of total disabled population is affected by GBS (Islam et al. 2011). But there is no actual data on wheelchair users in Bangladesh (neither on Google or Google scholar).

### Significance of the study

At present there is also no data about anthropometrical measurement of manual wheelchair users in Bangladesh. As a result the wheelchair users suffer from various types of musculoskeletal symptoms, which lead to decreased rate of their productivity and performance in daily activities. Thus knowledge about anthropometrical measurements of manual wheelchair users is essential to prevent the occurrence of such problems. For this reason, the researchers are

willing to conduct this study, which will be a literature resource for future study in this sector. This study will also help to estimate anthropometric measurement of Bangladeshi manual wheelchair users, which is again very important.

### **Aim of the study**

- ❖ To determine the anthropometric measurement of the Bangladeshi manual wheel chair users

## **Method**

### **Study design and settings**

To conduct this study, cross sectional survey method was used to carry out the research. In this research, estimation of Bangladeshi manual wheelchairs user's present anthropometrical measurements in 15 body dimensions analyzed. This study is aimed to find out the present anthropometrical estimation of Bangladeshi manual wheelchair users. The study was conducted in Dhaka city at Savar in the Centre for the Rehabilitation of the Paralyzed (CRP). This study was conducted from July to December, 2014. The manual wheelchair users as participants of this study were selected from Centre for the Rehabilitation of the Paralyzed (CRP), Savar and alongside of CRP, Savar. Participants were the patients from CRP and surrounding therapy centers, Staffs of CRP, students from MadhabSmriti Vocational School. **Sampling procedure**

Participants were selected based on inclusion criteria. Convenient sampling procedure was used throughout the process of selecting participants for this study. The researcher used convenience sampling procedure throughout the process of participants' selection. Participants for this study were selected

conveniently from above mentioned places. The participants were selected based on inclusion criteria. Convenient sampling is a process in which a sample drawn from the subjects is conveniently available. Researcher selects the participants who are convenient to the researcher.

### **Inclusion criteria**

Only the manual wheelchair users, age ranged 18-50 years old from CRP and alongside of CRP who use wheelchair as their primary means of mobility were allowed to participate in this study.

### **Exclusion criteria**

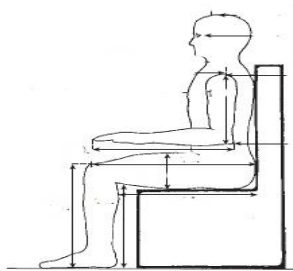
Wheelchairs were given to people only for treatment purpose but it was not permanent.

### **Data collection Procedure**

To collect data, researchers first communicate with the participants verbally. Then the researchers fixed a date of their convenient time. A brief description about the aims and objectives of the study has also been given to the participants. After taking consent from the participants about their voluntary participation on this study data was collected. Data collection was placed in the convenient places for the participants. A written consent was taken prior to the collection of data. Anthropometric Dimension chart for wheelchair users was adopted by Jacobs (2008) to use for data collection. In this presented research, researcher measured anthropometric body dimension of participants on their own wheelchair. After taking written consent from the participant's, data collection was started with explanations about this research from the participants. Data collection was done by measuring tape and use of ruler scale. A questionnaire was developed using the anthropometrics Dimension chart for wheelchair users adopted from Jacobs (2008).

During data collection there were different types of wheelchair with different heights. This made differences in the measurement. To avoid some unnecessary circumstance, researchers used a standard position. To collect anthropometric data, it was necessary to maintain standard anthropometric posture. For this research, researchers maintain the following standard sitting posture.

**Sitting down pose:** Anyone is located build and looks head-on, frontally; the particular sitting down area will be altered in order that the female or males' legs are usually simultaneous for the flooring as well as the joints is usually twisted into a 90-degree viewpoint with the feet floor from around the floor. The top will be peaceful and also perpendicular for the side to side airplane, as well as the lower arm is in an appropriate viewpoint for the higher provide and so simultaneous to the floor. Proportions for sitting down are manufactured by using a side to side reference point, both the earth or perhaps the seats, and also an up and down reference point, a great fictional series that will detail your back in the uncompressed bottom and also neck in the subject matter. Hence, inside the common sitting down pose, anyone will be assessed together with many joint parts, the particular rear foot, joints, cool, and also elbows from 90-degree sides (Jacobs 2008). (Figure 1 shows the standard sitting position for anthropometrical measurement)



**Figure 1:** Standard sitting position for anthropometrical measurement

Then measurements were taken using the measurement tapes. All the anthropometric measurements were taken between the key points. 15 anthropometric dimensions were measured. The dimension and measurement points (Figure 2 showing the all the key points of 15(1-15) dimensions) with how the measurements were taken has given below-

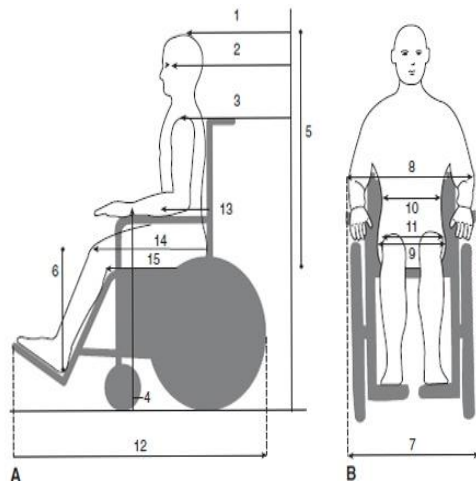
1. **Overall height:** Vertical distance from the floor to the crown of the head. To measure this dimension, after taking permission, the researcher puts a scale on head and measures the distance from the scale to the floor. Researchers maintained the upright posture carefully observed if the participants are in a slouch posture or not. Researcher was very much cautious about the position. He was also aware and cautious about maintaining the position of the scale, which is 90 degree horizontal to the crown of the head.
2. **Eye height:** Vertical distance from the floor to the inner corner of the eye. The researcher holds a pen beside the inner corner of the eye. Then the measurement was taken by using measuring tape from floor to the pen. The participants were in upright posture, pen was placed 90 degree horizontally to the corner of the eye
3. **Shoulder height:** Vertical distance from the floor to the acromion. Researcher first palpates the acromion process of the participants and then put a ruler scale in the top of the acromion. Then measured the distance between the ruler and floor. For every participant, the same upright position was maintained; no slouch posture. Ruler scale was placed 90 degree horizontally to the acromion.



4. **Wrist height:** Vertical distance from the floor to the wrist crease just below the radial styloid. This dimension was measured by keeping a ruler scale parallel to the radial styloid. Then measurement was taken from the scale to the floor. To measure wrist height researcher maintained same position for all participants. For all participants researcher maintained wrist in resting position up of the thigh.
5. **Sitting height:** Vertical distance from the seat to the crown of the head. This dimension was measured by the tape. A ruler scale placed on the crown of the head and the measurement from the ruler to the seat of the wheelchair. Participants were in upright position, slouch posture were strictly avoided.
6. **Knee height:** Vertical distance from the floor to the top of the patella. A ruler scale was placed on patella; then the measurement was taken from the scale to the floor Participants were in upright position and feet's were rested on the footrest.
7. **Overall breadth:** Distance between the parallel vertical planes that cross the lateral-most points of the individual or the individual's wheelchair. This measurement was taken between the lateral sides of the wheelchair. Researcher first identified the two most lateral points of the wheelchair and then took the measurement.
8. **Forearm to forearm breadth:** Distance between the lateral most point of the right and left forearms. Using measuring tape distance was measured between the most lateral points of two forearms of the participants. Two ruler scales were used to mark the lateral points of the forearms. After placing the scales the researcher measured the distance between two scales thus the breadth was found.
9. **Hip breadth:** Distance between the lateral most points of the right and left hips. Researcher palpates the most lateral points of the hip and measured the distance by measuring tape. Two ruler scales were used to identify the lateral most points of the hip. Researcher first identified the lateral most points of the hip and placed two scales then measured the hip breadth.
10. **Waist breadth:** Distance between the lateral most points of the right and left sides of the waist. Researcher measured the distance of the most lateral point of the waist by measuring tape. Researcher measured by using two scales for identifying the lateral point of waist and measurement tape for measurement.
11. **Thigh breadth:** Distance between the lateral most points of the right and left thighs. The researcher first identified the lateral points of the thigh and placed two scales for the purpose of marking point and then measured the distance by using measuring tape.
12. **Overall depth:** Distance between the parallel vertical planes that cross the anterior-most and posterior-most points of the individual or the individual's wheelchair. This dimension was measured by using the measuring tape. First the researcher put the scale on the lateral pint of the foot rest. Then the researcher took measures of the distance between the most posterior point of wheelchair and the scale.
13. **Abdominal extension depth:** Shortest perpendicular distance from seat back plane to the most protruding point of the abdominal region. The researcher

put a pen on the top of the abdomen vertically. Then measured the distance between the pen and the back of the seat.

14. **Buttock-knee length:** Horizontal distance from the uncompressed buttock to the patella. The researcher measured the distance from the back of the seat to the patella.
15. **Buttock-popliteal length:** Horizontal distance from the uncompressed buttocks to the underside of the knee at the popliteal angle. The researcher first palpates the uncompressed buttock of the participants and then put the ruler there. Then measured the distance between the ruler and the back of the popliteal angel.



**Figure 2:** This pictures showing the all the key points of 15(1-15) dimension

### Data Analysis

Data entry and analysis was performed by using the Statistical Package for Social Science (SPSS) version17. Analysis of the data through SPSS was done in Microsoft windows7. At first, the researcher selected the variables and then inputted data into SPSS. Descriptive

analyses were used to find out the frequencies and percentages of some demographical data such as- age, sex, educational level and work status. The researcher also calculated the body dimensions related to value and Standard Deviation (SD), 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentile values for the body dimension .5<sup>th</sup> percentile, 50<sup>th</sup> percentile and 95<sup>th</sup> percentile were carried out by using SPSS. Researcher used descriptive analysis and frequency analysis to find out the 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentile. Researcher used advanced frequency statistics and put 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentile value to the SPSS for finding out these values. SPSS allowed inputting percentile values for finding out.

### Ethical considerations

To conduct this study, permission from the ethical committee of BHPI was taken. The Ethical Committee of BHPI monitored the research throughout the research process till completion. Informed consent was taken from the participants. Confidentiality of the participants was maintained strictly and participant could not be individually identified. All participants were informed about the aim of the study. While taking the measurement, participant's safety was the priority to maintain.

## Result

### Socio-Demographic characteristics of the participants

There are total 90 participants in this study; among them 75 (83.3%) are male and 15(16.7%) are female. Table 1 shows that maximum participants are aged between 18-28 years (46.2%). The researcher used participants from 18-50 years old. Researcher used three categories for analyzing the aged range, categories are- 18-28 yrs, 29-39yrs and 40-50yrs. 34.4% are age ranged 29-39 years and

22.2% are age ranged 40-50 years old. In this research the result found that most of the participants are literate. The researcher used 8 categories to find out educational level. They have at least studied up to class eight or below S.S.C (23.3%). Only 15.6% participants are illiterate and 1.1% can only sign their name. Rate of graduation and post-graduation is 5.6%, 18.9% having passed S.S.C and 8.9% have completed H.S.C. A significant number of participants (21.1%) have attended school and studied below class five. 66.7% participants are not doing any job or productive activity, only 33.3% participants are productive and doing business or a job in total.

### **Reason for wheelchair using**

72.2% participants are using wheelchair after spinal cord injury, 16.7% participants use wheelchair following Guillain-Barre syndrome, 6.7% participants are using wheelchair after Polio and 4.4% are using wheelchair due to Transverse myelitis. Table-2 shows the complete statistics.

### **Anthropometric Measurements of Manual Wheelchair users**

Table- 3 shows descriptive statistics for each anthropometric body dimension for manual wheelchair users. Statistics are given as mean, standard deviation and also in 5<sup>th</sup>, 50<sup>th</sup> and 95<sup>th</sup> percentile, the anthropometric data of 15 body dimension of Bangladeshi manual wheelchair users.

## **Discussion**

In Bangladesh, there is no anthropometrical data for manual wheelchair users. Most probably, the presented anthropometric study will be the first research in Bangladesh that has been carried out among Bangladeshi manual wheelchair users in 15 body dimensions. The purpose of the study was to find out the

anthropometric estimation for Bangladeshi manual wheelchairs.

In India, a systematic analysis of existing studies was conducted to check Indian accessibility standards with the anthropometric measurement of the manual wheelchair users. Static dynamic anthropometric data from 15 Indian manual wheelchair users was measured. But there is no data for male and female separately. The mean total sitting height is 1155mm (115.5 cm), mean eye height is 1030mm (103cm), and mean knee height is 570mm (57cm). The present study shows mean overall height as 130.06cm for male and 126.25cm for female. Mean eye height for Bangladeshi male is 119.69cm and 115.58cm for female. Present study also shows mean knee height for Bangladeshi male 64.30cm and for female 61.05cm.

Anthropometrical estimation varies from country to country and reference point for measures. Barros and Soares (2012) stated that when the anatomical reference points are different, the same anthropometric variable will present different results. In a study, authors found that for measuring height of the seated person or overall height, variable was distance from the top of the head to the floor, where another study authors preferred to evaluate only the height of the segment head+ trunk. In this presented study, overall height was measured from the vertical distance of the floor to the crown of the head. These small variations can reflect differences in the measurements obtained. Because each cm or mm in anthropometric scales is very important and should be considered (Barros and Soares 2012). Another important choice or type of wheelchair is also an important variable for anthropometric measurement (Barros and Soares 2012). In a study, researchers provided the participants chair of their own, where another researcher measured body dimension



on participant's chair. Dimension of the wheelchair affect the anthropometric measurement of an individual. In this presented research, researcher measured anthropometric body dimension of participants on their own wheelchair.

There are not too many studies conducted all over the world based on anthropometry of manual wheelchair users. Mean overall height (129.95cm) for Bangladeshi male manual wheelchair users is lower than mean overall height for USA male manual wheelchair users (145.54cm). Mean overall height for USA female manual wheelchair users are (134.84cm) higher than overall height for Bangladeshi female manual wheelchair users is 121.11cm. Mean overall breadth of USA male manual wheelchair users (69.08cm) is higher than Bangladeshi male manual wheelchair users (41.34cm). Mean overall breadth of Bangladeshi female manual wheelchair users (37.61cm) is lower than mean overall breadth of USA female manual wheelchair users (69.2cm).

The mean and standard deviation of sitting height for Mexican male wheelchair users is respectably 128.28cm and 6.02 where this study presents mean sitting height and standard deviation of Bangladeshi male manual wheelchair users is 76.00cm and 4.90. On the other hand mean and standard deviation sitting height for Mexican female is respectably 122.65cm and 10.45, where mean sitting height and standard deviation of Bangladeshi female manual wheelchair users is 71.42cm and 4.26. Mean eye height for Mexican male wheelchair users is (119.69cm) and where mean eye height of Bangladeshi male manual wheelchair users is almost equal as (119.59cm) than Mexican. Mean eye height of Bangladeshi female manual wheelchair users is (114.58) cm which is higher than Mexican female wheelchair users (111.34cm).

Anthropometric measurement of 5<sup>th</sup> percentile sitting height of Mexican wheelchair users for male (117.28cm), USA male wheelchair users (68.83cm), Nigerian male (68.1cm) are higher than the 5<sup>th</sup> percentile sitting height of Bangladeshi male manual wheelchair users (67.60cm). The 95<sup>th</sup> percentile eye height of Mexican male wheelchair users (126.35cm), USA male (125.22cm), Nigerian male wheelchair users (77.9cm) is lower than Bangladeshi male manual wheelchair users (127.00cm).

Calculating human contact form is really a difficult work. Not just may be the entire body made up of circular, smooth describes, which are vulnerable to data compression, but also individuals additionally often slump over. Dimension techniques can vary through research to be analyzed based on the experts. Occasionally, due to some cost associated with anthropometric investigation, estimations are created utilizing mathematic equations depending on size. Even though these types give an affordable estimation, they might not possibly be completely precise. Sometimes instruments also vary, for example- a study conducted in 2003 used an electromechanical probe to measure the anthropometric data (Paquet& Feathers 2004). On the other hand, presenting research uses only measurement tapes to measure the anthropometrical data.

Study conducted by Das and Kozey in 1999 estimated 62 Canadian manual wheelchair users, among which 42 were male and 20 were female. Das and Kozey analyzed 17 body dimensions where present study analyses 15 body dimensions. Das and Kozey estimated mean eye height of Canadian male as 735mm (73.5cm), where mean eye height of Bangladeshi male is 119.69cm, much higher than Canadian male. Das and Kozey used photogrammetry and measurements were taken in laboratory settings, where present research





takes measurement in actual environment and using measurement tape. 5th percentile shoulder height of Das and Kozey's research is 468mm (46.8cm), which is lower than 5th percentile shoulder height of Bangladeshi male 95 cm.

A study conducted in USA by using electromechanical probe estimates that mean overall height of USA male is 13.9 cm and 5<sup>th</sup> percentile overall height 121.6cm 50<sup>th</sup> percentile 131.2 cm and 95<sup>th</sup> percentile overall height is 139.4cm (Paquet& Feathers 2004), where mean overall height of Bangladeshi males is 130.06cm , 5<sup>th</sup> percentile 121.65cm, 50<sup>th</sup> percentile 131.00cm and 95<sup>th</sup> percentile 139.20. It seemed that mean overall height of Bangladeshi males is lower than USA male, 5<sup>th</sup> percentile overall height of Bangladeshi male is almost equal, 50<sup>th</sup> percentile overall height and 95<sup>th</sup> percentile overall height is also almost equal as USA male.

Mean overall breadth of USA male is 71.3 cm which is higher than mean overall breadth of Bangladeshi male (41.45cm). 5<sup>th</sup> percentile overall breadth of USA male is 60.4 cm where 5<sup>th</sup> percentile overall breadth of Bangladeshi male is 27.00 cm, which indicates a significant difference between Bangladeshi and USA males. 50<sup>th</sup> USA male is 70.9 cm and 83.9 cm (Paquet& Feathers 2004) respectively where 50<sup>th</sup> percentile and 95<sup>th</sup> percentile overall breadth of Bangladeshi male is 39.00cm and 64.80cm, i.e. respectively is lower.

Mean overall depth of USA male is 119.0 cm, where mean overall depth of Bangladeshi male is lower than USA male (94.65 cm). 5<sup>th</sup> percentile, 50<sup>th</sup> percentile and 95<sup>th</sup> percentile overall depth of USA male are- 12.0 cm, 116.1cm, and 132.9cm (Paquet& Feathers 2004), where 5<sup>th</sup> percentile, 50<sup>th</sup> percentile and 95<sup>th</sup> percentile overall depth of Bangladeshi

male 85.00cm , 94.00cm and 100.00cm (lower than USA male).

Mean Abdominal extension of USA male is 35.6 cm and mean abdominal extension of Bangladeshi male is 14.60 cm.

Mean overall sitting height of Mexican female is 122.85cm, where mean overall sitting height of Bangladeshi female is 126.28cm, 5<sup>th</sup> percentile and 95<sup>th</sup> percentile overall sitting height of Mexican females are- 111.04 cm and 132.12 cm, where 5<sup>th</sup> percentile and 95<sup>th</sup> percentile overall sitting height of Bangladeshi female are- 110.00 cm and 137.00cm, which is higher than the females of Mexico. On the other hand, the mean overall sitting height of USA females is 125.4cm; 5<sup>th</sup> percentile and 95<sup>th</sup> percentile overall sitting height is 113.9cm and 125.5cm, which is also lower than Bangladeshi female

## Conclusion

Anthropometry is an important aspect of ergonomics. Especially, anthropometrical estimation for wheelchair mobile persons is very important. It allows making an environment and workplace accessible and provides more degree of freedom. To fulfill the needs of comfort and function, anthropometric data provides the parameters of human size and shape of wheelchair users. In summary, this research has given Structural anthropometric measurements of male and female wheelchair mobile adults, who were determined in terms of mean, standard deviation, 5th, 50th and 95<sup>th</sup> percentiles, minimum and maximum values, on the basis of a sample of 75 males and 15 females. This research has also provided the demographic information and type of dysfunction of the wheelchair mobile subjects, who were provided the wheelchairs. The



anthropometric studies of adult wheelchair users belong to the pioneer work in this field in Bangladesh. The percentile characteristics developed for the disabled men and women constitute a set of basic anthropometric data for the design of workstations and home interiors. Percentile values of characteristics including dimensions of the wheelchairs make it possible for designers to treat the user and the wheelchair as a whole (The human-chair system).

### List of abbreviations

WHO- World Health Organization  
 UNICEF- The United Nations Children's Emergency Fund  
 CRP- Centre for the Rehabilitation of the Paralysed  
 CDC: Centers for Disease Control and Prevention

### Authors Contribution

Tariqul Islam Sajeeb is the sole author of this research paper. Tariqul carried out this cross-sectional study. He completed research design, collected data and statistically analyzed the data. He drafted the manuscript and after going through editorial request he also finalized the manuscript.

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### Competing interests

The author declares that he has no Competing interests. This research was done as a part of academic curriculum of Bachelor of Occupational Therapy. Researcher completed the research on his own finance under the CRP Ethical Committee.

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**Table-1: Socio-demographic characteristics of the participants**

Variables	N*=90	%
<b>Age in years</b>		
18-28 years	39	43.3
29-39 years	31	34.4
40-50y years	20	22.2
<b>SEX</b>		
Male	75	83.3
Female	15	16.7
<b>Education Level</b>		
Below Class Five	19	21.1
S.S.C	17	18.9
H.S.C	8	8.9
Illiterate	14	15.6
Can only sign name	1	1.1
Graduate	5	5.6
Post Graduate	5	5.6
Below S.S.C	21	23.3
<b>Work Status</b>		
Productive	30	33.3
Non-productive	60	66.7

N: Participants number, %: percentage of participants

**Table-2: Conditions associated with using wheelchair**

Condition	N*=90	%
Spinal cord Injury	65	72.2
Guillain- Barea Syndrome	15	16.7
Polio	6	6.7
Transverse Myelitis	4	4.4

N: Participants number, %: percentage of participants

**Table-3: Mean, SD and percentile values (cm) for Bangladeshi manual wheelchair users, male (n=75) and female (n=15).**

Dimension	Male Percentile					Female Percentile				
	5 <sup>th</sup>	50 <sup>th</sup>	95 <sup>th</sup>	Mean	SD	5 <sup>th</sup>	50 <sup>th</sup>	95 <sup>th</sup>	Mean	SD
Overall Height	121.65	131.00	139.20	130.06	4.55	110.00	129.00	137.00	126.25	7.728
Eye Height	108.40	120.00	127.00	119.69	5.48	102.00	117.00	118.20	115.58	7.575
Shoulder Height	95.00	106.00	114.20	103.99	12.522	85.00	100.00	115.40	101.48	8.262
Wrist Height	60.80	72.00	88.00	71.83	6.50	53.60	66.00	79.40	66.23	7.182
Sitting Height	67.60	75.00	84.00	76.00	4.909	57.60	72.00	88.40	71.42	8.370
Knee Height	43.60	66.00	75.20	64.30	8.739	43.00	64.00	77.00	61.05	10.880
Overall breadth	27.00	39.00	64.80	41.34	10.058	22.20	36.00	51.00	37.61	9.618
Forearm to Forearm Breadth	29.00	35.00	48.00	36.79	5.908	22.20	32.00	44.40	32.71	5.557
Hip Breadth	12.00	29.00	36.60	28.95	4.312	16.80	29.00	37.20	28.55	4.463
Waist Breadth	21.00	30.00	33.00	28.77	3.447	23.60	29.00	32.40	28.10	2.688

Thigh Breadth	20.00	31.00	35.20	30.36	4.822	22.60	31.00	41.80	30.71	4.525
Overall Depth	85.00	94.00	100.00	94.35	3.718	91.80	98.00	101.40	97.00	2.720
Abdominal Extension Depth	14.60	19.00	28.20	20.04	4.467	15.00	19.00	28.40	19.00	3.098
Buttock-knee length	23.00	30.00	47.00	31.68	5.859	19.20	29.00	37.00	28.45	4.335
Buttock-popliteal Length	12.00	24.00	29.40	22.79	5.001	12.80	24.00	28.00	22.45	4.646

**Appendix- 1A**

**Questionnaire**

**Questionnaire for measuring anthropometrical measurement of Bangladeshi manual wheelchair user's**

**Personal Information**

**Name:**

**Age:**

**Sex: M/F**

**Educational Background:**

**Family Members:**

**Is he/she productive (Doing any job)? -**

**Earning member of the family:**

**Reason for Disability/ using Wheelchair:**

**Home district:**

**Use of home modification: Y/N**

**Anthropometrical measurement chart Adapted from Jacobs (2008):**

Dimension	Description	Findings (In cm)
1. Overall height	Vertical distance from the floor to the crown of the head.	
2. Eye height	Vertical distance from the floor to the inner corner of the	

	eye.	
3. <b>Shoulder height</b>	Vertical distance from the floor to the acromion.	
4. <b>Wrist height</b>	Vertical distance from the floor to the wrist crease just below the radial styloid.	
5. <b>Sitting height</b>	Vertical distance from the seat to the crown of the head.	
6. <b>Knee height</b>	Vertical distance from the floor to the top of the patella.	
7. <b>Overall breadth</b>	Distance between the parallel vertical planes that cross the lateral-most points of the individual or the individual's wheelchair.	
8. <b>Forearm to forearm breadth</b>	Distance between the lateral most points of the right and left forearms.	
9. <b>Hip breadth</b>	Distance between the lateral most points of the right and left hips.	
10. <b>Waist breadth</b>	Distance between the lateral most points of the right and left sides of the waist.	
11. <b>Thigh breadth</b>	Distance between the lateral most points of the right and left thighs.	
12. <b>Overall depth</b>	Distance between the parallel vertical planes that cross the anterior-most and posterior-most points of the individual or the individual's wheelchair.	
13. <b>Abdominal extension depth</b>	Shortest perpendicular	



	<b>distance from seat back plane to the most protruding point of the abdominal region.</b>	
<b>14. Buttock-knee length</b>	<b>Horizontal distance from the uncompressed buttock to the patella.</b>	
<b>15. Buttock- popliteal length</b>	<b>Horizontal distance from the uncompressed buttocks to the underside of the knee at the popliteal angle.</b>	

## **Appendix – 2A: Additional Documents**

### **Permission from the academic Institute**



### Permission Letter

Date: December 10, 2013  
 To  
 The Head of the Department  
 Department of Occupational Therapy  
 Bangladesh Health Professions Institute  
 C.R.P, Chapain, Savar  
 Dhaka-1343

Subject: An application for seeking permission to conduct the research project.

Sir,

With due respect and humble submission to state that I am seeking permission to conduct the research project as a part of my 4<sup>th</sup> year course module. My research title is "Anthropometric measurement for Bangladeshi manual wheelchair users". The aim of this study is to determine the anthropometric measurement of the Bangladeshi manual wheel chair users. Now I am seeking for your kind approval to start my research project and I would like to ensure that anything's of my study will not bring any harm to the participants.



So I therefore pray and hope that you would be kind enough to grant me the permission to conduct the research and will help me to conduct a successful study as s part of my course module.

I remain  
 Sir

*Tariqul Islam Sajeeb*

Tariqul Islam Sajeeb  
 4<sup>th</sup> year B.Sc in Occupational Therapy  
 BHPI

Attachment: Proposal of the study.

Signature and comments of the supervisor <i>It is recommended for further procedure.</i>  10/DEC/13	Signature and comments of the Head of the Department <i>As per supervisor's recommendation it may win to conduct this study. Best of luck.</i>  10/12/13
<b>Md. Monjurul Habib</b> Lecturer In Occupational Therapy Dept. of Occupational Therapy Bangladesh Health Professions Institute (BHPI) Center for the Rehabilitation of the Paralyzed (CRP) Savar, Dhaka-1343, Bangladesh	<b>Nazmun Nahar</b> Assistant professor Head of the Department Dept. of Occupational therapy Bangladesh Health Professions Institute (BHPI) Center for the Rehabilitation of the Paralyzed (CRP) Savar, Dhaka-1343, Bangladesh

### Permission from CRP Ethical Committee



পক্ষাঘাতগ্রস্তদের পুনর্বাসন কেন্দ্র (সিআরপি)  
**Centre for the Rehabilitation of the Paralyzed (CRP)**  
 a project of the Trust for the Rehabilitation of the Paralyzed  
**Head Office:** CRP-Savar, CRP-Chapain, Savar, Dhaka-1343, Bangladesh  
 Tel: +880 (0)2-7745464-5, Fax: 7745069, E-mail: [contact@crp-bangladesh.org](mailto:contact@crp-bangladesh.org), Website: [www.crp-bangladesh.org](http://www.crp-bangladesh.org)

Ref:

Date:

CRP/R&amp;E/0401/75

29/12/2013

To

Tariqul Islam Sajeeb

4<sup>th</sup> year B.Sc. in Occupational Therapy, BHPI

**Subject: Accept to conduct research on** “Anthropometric measurement for Bangladeshi manual wheelchair users”

Dear Mr. Tariqul Islam Sajeeb,

Thank you very much for showing your interest of your undergraduate dissertation at CRP. We are pleased to accept your request as per your convenience.

You are requested to contact directly with the relevant departmental head/unit in-charge to fix up your schedule as per requirement of your work.

We will highly appreciate if you please submit an approved copy of your thesis work to the undersigned after completion for our learning and record.

Please note that CRP will not be responsible for the food, transport or any other logistics during your thesis work.

Sincerely,

*Morshedul*

Md. Morshedul Quadir  
 Research Associate  
 Research and Evaluation Department  
 CRP, Savar, Dhaka-1343

On behalf of Ethics Committee, CRP

**Branch Offices:** CRP-Mirpur, Plot: A/5, Block-A, Section-14, Mirpur, Dhaka-1216, Tel: +880(0)2-8020178, 8053662-4, Fax: 8053661, **CRP-Gonokbari:** P.O: Bolivadra Bazar, P.S. Ashulia, Savar, Dhaka, Tel: 880-2-7789281, **CRP-Gobindapur:** P.O. Kazoldhara, P.S. Kulaura, Dist. Moulvibazar, Mobile- 01711 446104  
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**Permission from Karon Jacobs Author of the book “Ergonomics for Therapists”**

Dear Tariqual,

Good morning. It is nice to hear from you. Your project sounds very interesting.

It is fine for you to use any of the information in Ergonomics for Therapists. However, to reproduce a table and publish it in your dissertation would require copyright permission from the publisher. If you want to include the pages you mentioned in your dissertation, please contact the publisher of the textbook.

Thank you for being in touch and I wish you my best.  
Karen

Karen Jacobs, Ed.D., OTR/L, CPE, FAOTA  
Clinical Professor  
Program Director, Distance Education Post-professional Occupational Therapy Programs Boston University  
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“Never doubt that a small group of thoughtful, concerned citizens can change the world. Indeed, it is the only thing that ever has.” Margaret Mead



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### Consent form (English)

#### Consent form (English)

Assalamu-alaikum/ Namasker. My name is Tariqul Islam Sajeeb Student of B.Sc. in Occupational therapy at Bangladesh Health Professions Institute (BHPI), CRP. I am conducting a study for partial fulfillment of B.Sc. in Occupational Therapy degree, titled, **“Anthropometric measurements of Bangladeshi manual wheelchair users”**

Through this research, I will measure the 15 dimensions of Bangladeshi manual wheelchair users. For this regard, I would need to collect data from the Bangladeshi manual wheelchair users. Considering the area of research, you have met the inclusion criteria and I would like to invite you as a subject of my study. If you participate in this study, I will measure your various body dimensions. The measurements that would be given are safe and will not cause any harm. I want to meet you a sessions during your free time. Your participation will be voluntary. You have the right to withdraw consent and discontinue participation at any time. Information from this study will be anonymously coded to ensure confidentiality.

If you have any query about the study or your right as a participant, you may contact with, researcher Tariqul Islam Sajeebor Md. MonjurulHabib lecturer in Department of Occupational Therapy, BHPI, CRP, Savar, Dhaka-1343.

Do you have any questions before I start?

So may I have your consent to proceed with the participation?

Yes:

No:

Signature of the Researcher \_\_\_\_\_

I .....have read and understand the contents of the form.

I agree to participant in the research without any force.

Signature of the participant \_\_\_\_\_