Original Article

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Anthropometric Measurements of Hypertensive Patients with Special Emphasis on Facial Features

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Abstract

Context: Anthropometric measurements are being used profusely for various medicalresearches. Studies on craniofacial anthropometry have allowed for identification andquantification of syndromic clinical features, planning for treatment, monitoring ofoperative outcomes and sometimes assessment of longitudinal change.Considering that Anthropometry can be important tool in early suggestion of diseases, anattempt was made to study facial Anthropometry in healthy individuals andhypertensive subjects. *Aim:* The aim of the study was to compare the Anthropometric Measurements in hypertensivepatients and healthy control subjects. *Settings and Design*: The study was conducted in the Anthropometry section of Department of Anatomy, Mahatma Gandhi Institute of Medical Sciences (MGIMS) incollaboration with Department of Medicine. It was a cross-sectional, Observational study design incorporating a total of 100subjects. *Methods and Material*: Out of hundred registered for study, fifty were healthy controls and fifty patients in theage range of 34-50 years diagnosed to have hypertension from Sevagram village (a rural area in Vidharbha region of Maharshtra). The instruments used for study are Stadiometer, Digital weighing balance, Spreading Caliper, Vernier caliper and measuring tape and sphygmomanometer for measuring Blood Pressure. Various measurements were made pertaining to facial anthropometry andon the basis of the findings as per literature available, the indices calculated are Physiognomic Facial Index, Morphological Facial Index, Mandible Width-Face Height Index, Sagittal Naso-FacialIndex, Mandible-Face Width Index, Chervinïs Transverse Cephalo-Facial Index. *Results*: The indices thus obtained are compared for males and female's separately. Most of the indices are non- significant except Mandible-Face Width Index in femalesand Physiognomic Facial Index and Morphological Facial Index in males. *Conclusion*: Facial Anthropometry was done on healthy and hypertensivesubjects. Though the data analysis have not concluded any change in facialanthropometry in hypertensive subjects with affirmation but the data obtained forcontrol subjects in Central Indian Population can further be utilised byAnthropometrics, , Anatomists, Forensic Experts and Plastic surgeons too.

Keywords: Anthropometry; Facial Anthropometry; Hypertensive Patients.

Introduction

Anthropometry is a biological anthropology or art of science used for the measurement of soft tissue and body proportions for the study of human evolution [1]. Anthropometric measurements are used eventually for various medical researches. Anthropometry is a branch of Morphometry which is the study of size and shape of biological components and their variations in populations.[2] Morphometrics has gone under revolution in the last two decades as numerous new techniques have been produced to address shortcomings in the Traditional Multivariate Analysis of Linear distances, Angles and Indices [3]. Analysis of Face is not only useful for Identification, Sports Medicine, Tele-Communications but also has got a clinical application for diagnosis of many diseases [4].

Changes in lifestyles, nutrition, and ethnic composition of populations lead to changes in the distribution of body dimensions (e.g. the obesity

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epidemic), and require regular updating of anthropometric data collections. Studies on craniofacial anthropometry have allowed for identification and quantification of syndromic clinical features, treatment planning, monitoring of operative outcomes, and assessment of longitudinal change [5,6].

Hypertension is defined as systolic and/or diastolic blood pressure of 140/90 mm Hg or more, and/or medication use for decreasing hypertension [7,8,9].

The World Health Organization (WHO) categorizes high blood pressure (BP) as the top risk factor for death rate, accounting for 13% of fatalities globally. Also, hypertension, or the 'silent killer' as it is also known, has been recognized as an important risk factor for cardiac arrest, stroke, kidney disease, and increased mortality rates in adults (WHO 2014) [10].

High blood pressure, also called "hypertension," is a serious medical condition. It happens when the force of the blood pumping through your arteries is too strong. The flow and pressure of blood in the arteries rises with each pump or pulse; this is the systolic or higher pressure reading. The resting or lower pressure between each pulse is called the diastolic pressure.

A person's blood pressure reading includes both figures, systolic/diastolic, expressed in millimetres of mercury.

A variety of symptoms may be indirectly related to high BP but are not always caused by it, such as facial flushing. Facial flushing occurs when blood vessels in the face dilate.

Since edema is also closely linked with hypertension, and because the accumulation of an excessive amount of body fluid in the tissue spaces between cells or in body cavities are noticeable in the overall physical appearance of the individual especially the face [11].

The aim of the study was to evaluate the Anthropometric Measurements in patients of hypertension and healthy control subjects. Following objectives were catered to:

1. To study the anthropometric measurements especially the facial proportions of hypertensive subjects and healthy controls.
2. To compare the anthropometric measurements and facial proportion of hypertensives and control population. Comparison was done amongst same sexes in two groups.

Material and Methods

Type of Study

It was a cross-sectional, Observational study design incorporating a total of 100 subjects.

Study Participants

Out of 100, fifty were healthy controls with Systolic BP <120 mm of Hg or Diastolic BP < 80 mm of Hg and fifty patients in the age range of 35-50 years diagnosed to have hypertension (Systolic BP >140mm of Hg or Diastolic BP > 90 mm of Hg), from Sevagram village of Wardha region of Maharashtra were recruited as cases [10]. Out of these fifty, 22 were females in both group and 28 males in both the group.

Setting

The study was conducted in the Anthropometry section of Department of Anatomy, Mahatma Gandhi Institute of Medical Sciences (MGIMS) in collaboration with Department of Medicine of the same institute. It is a rural Medical College & hospital located in a village, Sevagram in Wardha district in central India.

Ethics Consideration

A written informed consent was obtained from all study participants. It was ensured that consent is (a)given voluntarily, (b)fully informed, (c)and is obtained from the persons who are competent to do so.

In the consent form, the aims of the study were explained, the anticipated benefits and the risks, and the right to withdraw from interview process at any time without any reprisals. The use of confidential patient data will be fully within the recent guidelines from the Indian Council of Medical Research (ICMR) about the use of personnel information in medical research. Approval for conducting the study from the institutional Ethics Committee was received before commencement of the study.

Sample Size

Sample size was estimated using statistical software with following assumptions.

Confidence level - 95%

Confidence Interval- 10

(Population of Sevagram is approximately 7000) Sample size estimated was 95. Taking this into account, we planned to go for total of 100 subjects divided into two groups of cases and control subjects considering the economic feasibility as well as the time frame required for the completion of the short term research.

Sampling Procedure

By Random sampling method, samples had been recruited.

Inclusion Criteria

1. Persons from age group of 35-50 years.
2. Diagnosed patients of hypertension will be the cases and healthy people of the same age group with normal Blood Pressure and without any h/o significant illness will be included as controls.

Exclusion Criteria

- Previous history of Facial surgery or orthodontic treatment,
- Any obvious defect or deformity.
- Patients suffering from Diabetes , Thyroid Disease, Liver Failure, Haemolytic Jaundice, Renal diseases, Psychosis and other metabolic disorders.

Anthropometric Measurements

Somatometric measurements were conducted over both the groups (case and control) by the same individual at the same fixed time as per standard procedure laid by Singh P and Bhasin MK(2004) [2].

[1] Breadth Measurements of Head and Face

A. Maximum Head Breadth

It measures the straight distance between the two eurya(eu).

B. Physiognomic Facial Height

It measures the straight distance between trichion(tr)and gnathion(gn)

C. Morphological Facial Height

It measures the straight distance between nasion(n)and gnathion(gn)

D. Bizygomatic Breadth

It measures the straight distance between the two zygia(zy)

E. Bigonal Breadth

It measures the straight distance between the gonia/gonion.

F. Nasal Height

It measures the straight distance between nasion(n)and subnasale(sn)

[2] Indices of Face

A. Physiognomic Facial Index

Physiognomic Facial Height ÷ Bizygomatic Breadth ×100

B. Morphological Facial Index

Morphological Facial Height ÷ Bizygomatic Breadth×100

C. Mandible Width-Face Height Index

Bigonal Breadth÷Morphological Facial Height ×100

D. Sagittal Naso-Facial Index

Nasal Height÷ Morphological Facial Height×100

E. Mandible-Face Width Index

Bigonal Breadth ÷ Bizygomatic Breadth×100

F. Chervinïs Transverse Cephalo-Facial Index

Bizygomatic Breadth ÷ Maximum Head Breadth×100

Anthropometric Instruments used

Stadiometer, Digital weighing balance, Spreading Calliper, Vernier calliper and measuring tape.

BP measurement was done using mercury sphygmomanometer.

Data Collection Method

All the data were abstracted on a standardized data collection form. MS excel spreadsheet was used

to enter the data electronically. Data were expressed as mean ± SD.

Statistical Analysis

Chi-square test and some graphical tools were employed for finding association between categorical variables.

Results

A total of six indices were obtained for both the sexes in each group.

The findings for females and males are as follows:

For Females-

The mean± SD of Physiognomic Facial Index for experimental females is found to be 141.71±9.98 whereas for control females it was 136.01±12.07.

The mean ± SD of Morphological Facial Index for experimental females was found to be 85.21±8.04 whereas for control females it was 84.99±9.26

The Mandible Width-Face Height Index for experimental females was obtained as 103.88±10.65 whereas for control females it was 97.28±10.23.

Sagittal Naso-Facial Index for experimental females was estimated as 42.92±6.40 whereas for control females it was 44.73±6.04.

Mandible- Face Width Index for experimental females was evaluated as 87.42±4.99 whereas for control females it was 81.92±4.53.

Chervind's transverse Cephalo-Facial Index for experimental females was found to be 96.39±4.26 whereas for control females it was 96.39±5.48.

For Males

The Physiognomic Facial Index for experimental males was found to be 135.10±8.86 whereas for control males it was 140.16±10.64.

The Morphological Facial Index for experimental males was found to 81.31±6.59 whereas for control males it was 87.59±12.17.

The Mandible Width-Face Height Index for experimental males was found to be 105.01±12.40 whereas for control males it was 100.38±11.15. Sagittal Naso-Facial Index for experimental males was found to be 43.69±5.76 whereas for control males is 43.79±9.70.

Mandible- Face Width Index for experimental males was found to be 84.74±5.88 whereas for control males it was 86.80±4.89.

Chervind's transverse Cephalo-Facial Indexfor experimental males was found to be 101.14±7.38 whereas for control males it was 98.91±3.86.

The data thus obtained was compared in control and cases group. The comparison is as shown in Table 1 & 2.

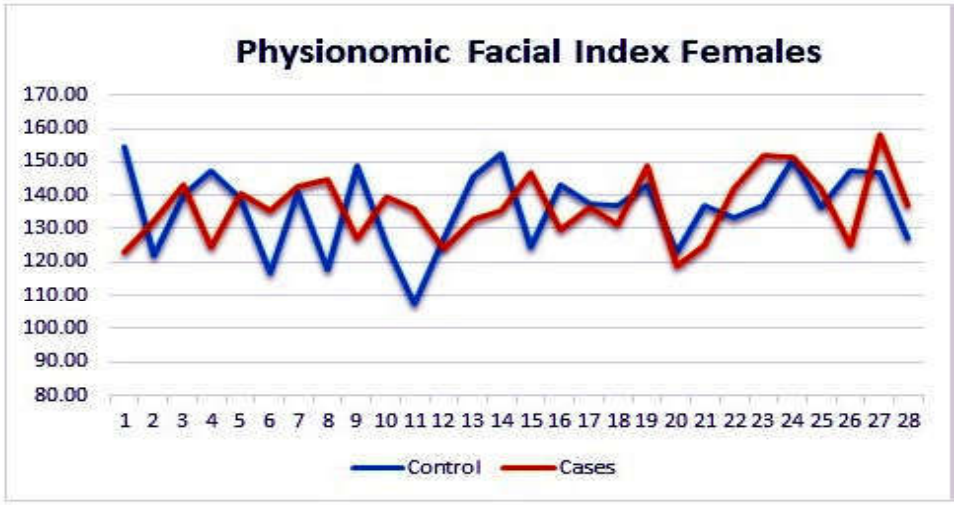
Individual facial anthropometric indices sex wise are shown in Figure1 and Figure 2.

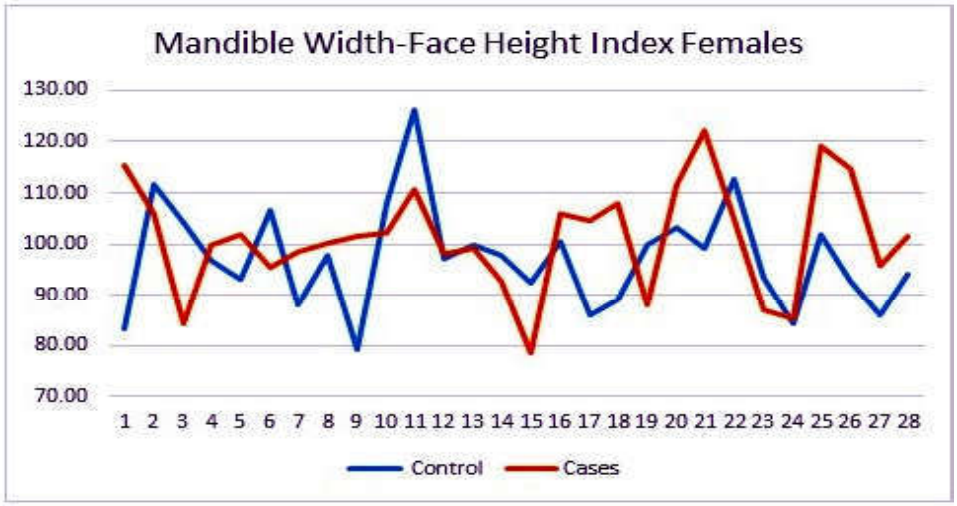
Table 1: Comparison of various indices in Females

	Physiognomic Facial Index	Morphological Facial Index	Mandible Width-Face Height Index	Sagittal Naso-Facial Index	Mandible-Face Width Index	Chervind's Transverse Cephalo-Facial Index
p Value	0.41	0.41	0.09	0.40	0.01	0.19
	Non-significant	Non-significant	Non- significant	Non-significant	Significant	Non significant

Table 2: Comparison of various indices in Males

	Physiognomic Facial Index	Morphological Facial Index	Mandible Width-Face Height Index	Sagittal Naso-Facial Index	Mandible-Face Width Index	Chervind's Transverse Cephalo-Facial Index
p value	0.05	0.02	0.10	0.48	0.11	0.11
	Significant	Significant	Non-significant	Non-significant	Non-significant	Non-significant





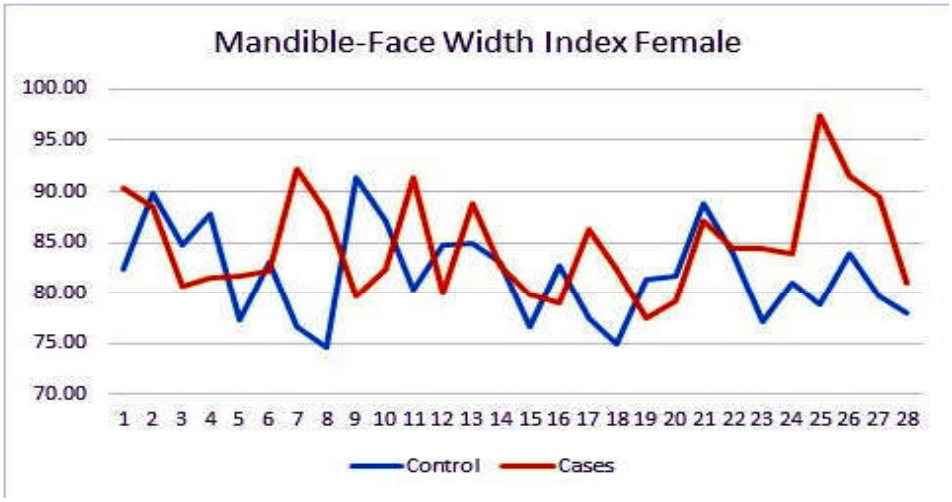
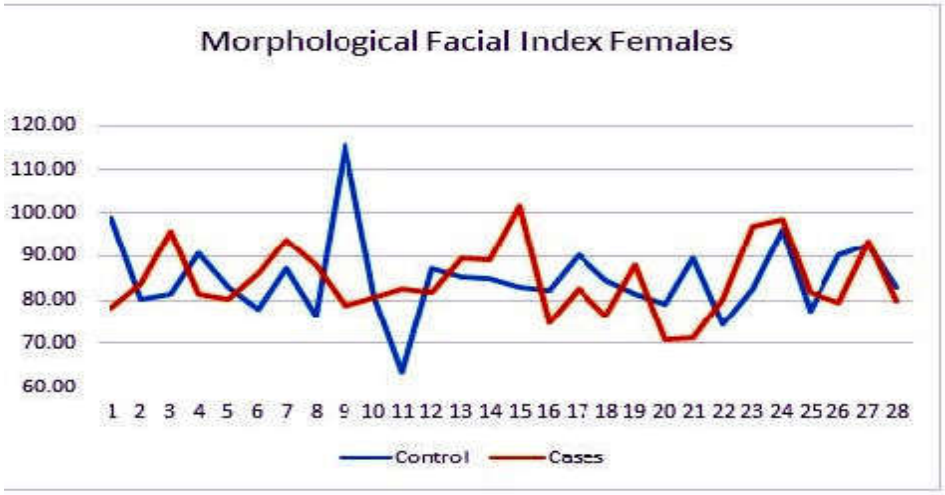
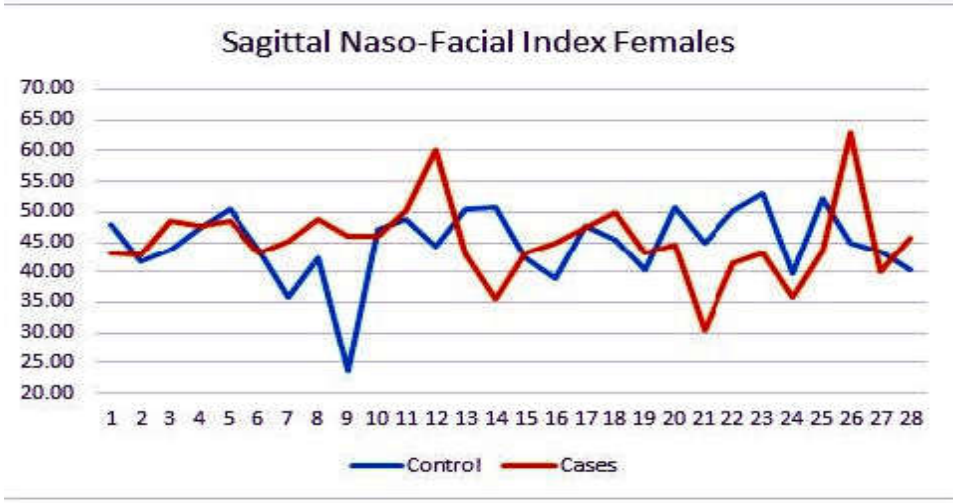
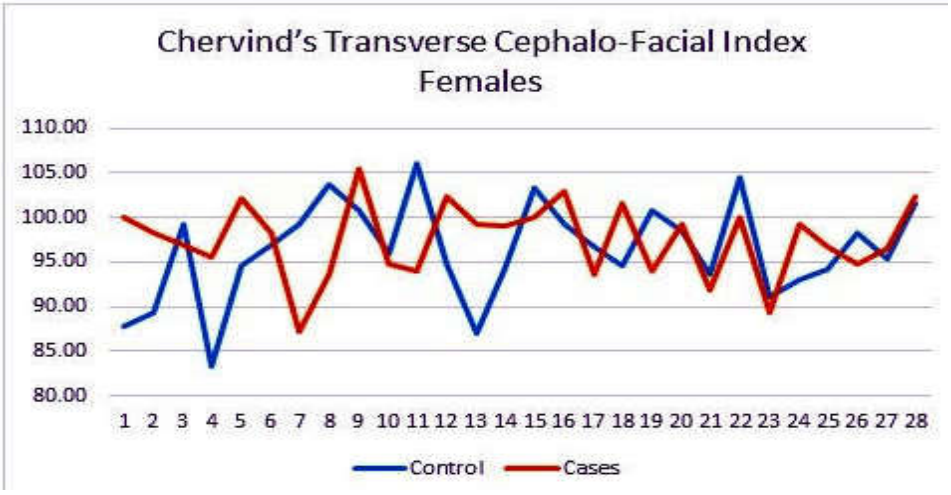


Fig. 1: The various charts are showing depiction of individual findings obtained in controls and cases for Females







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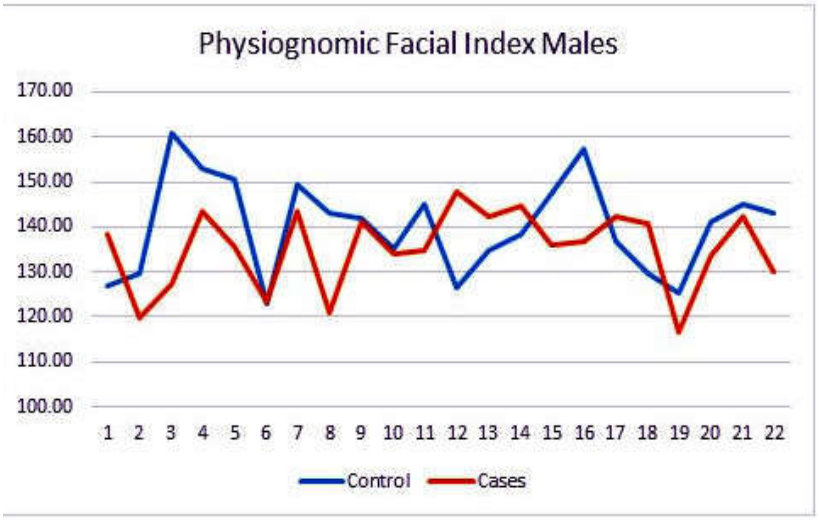
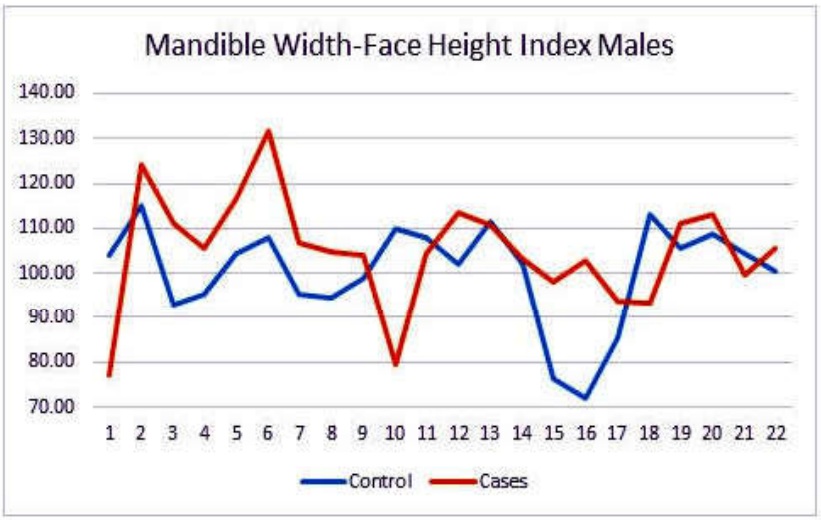




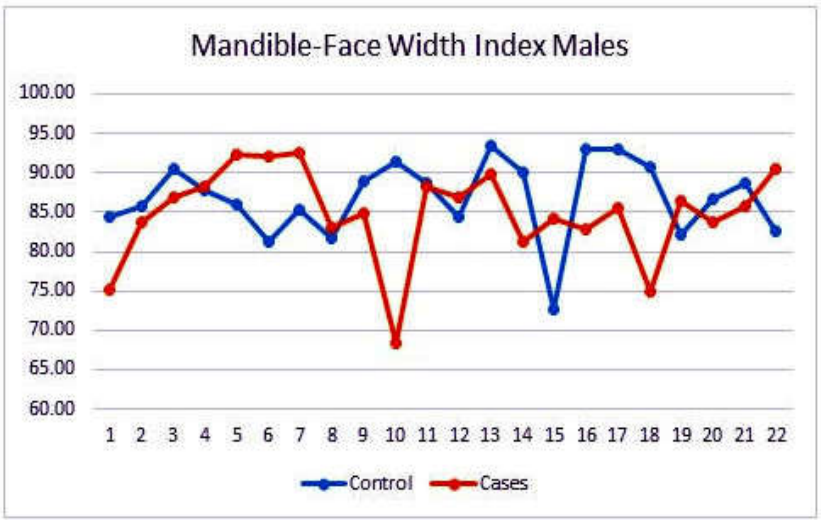
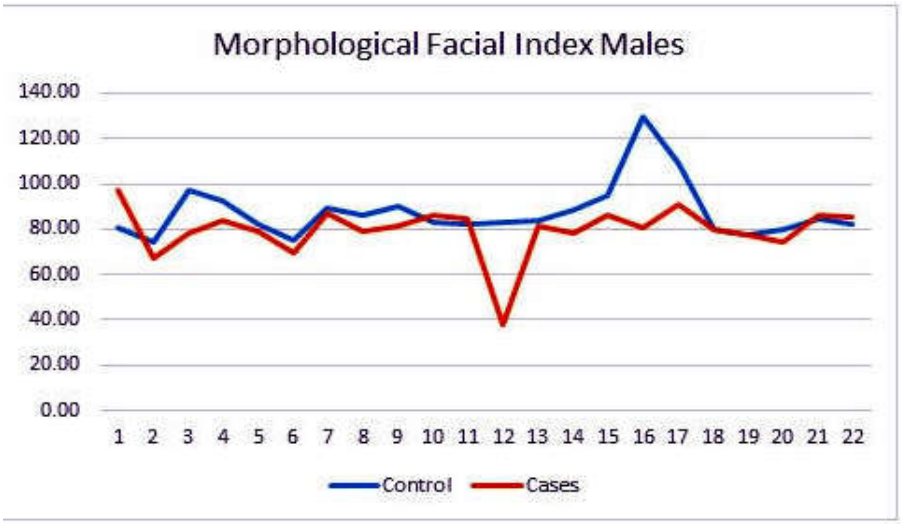
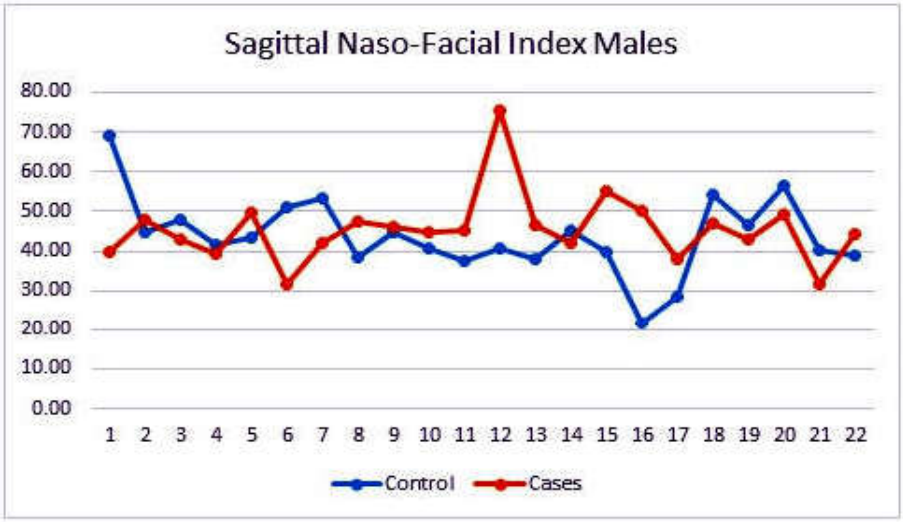


Fig. 2: Showing various charts of the observations of different indices in males in cases and control





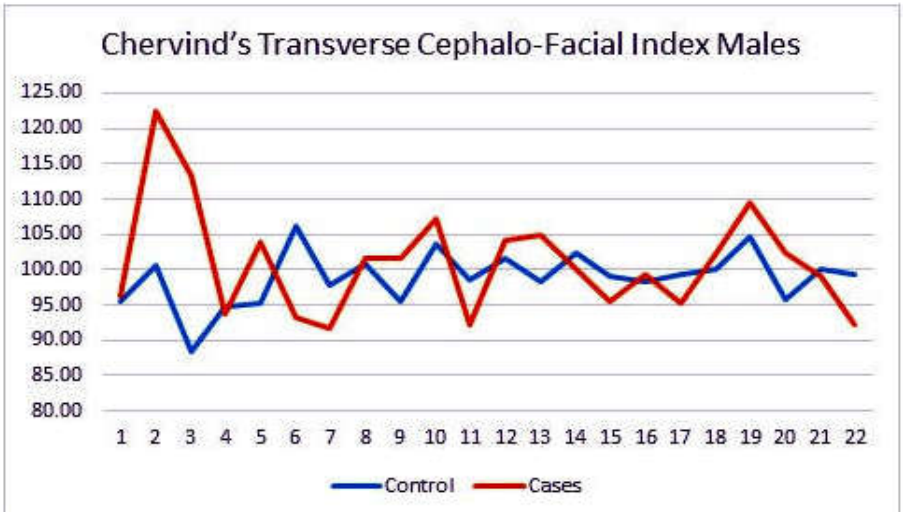


Fig. 2: Showing various charts of the observations of different indices in males in cases and control

Discussion

Facial analysis has been quite crucial in studies of health related concerns [12-15]. While there are studies that show minor anomalies occurring in normal human populations at low frequencies, deviations from normal values can be indicative of a health problem [14,15].

In the present study, the variations in facial morphometrics between diabetics and non-diabetics was explored. The observations of this study are not in accordance with many studies which have reported changes in the face of people with chronic diseases such as diabetes, hypertension and arthritis [16,17,18].

Based on the analysis of landmarks as shape variables, the face shape of diabetics was found to be rounder and less tapered compared to that of nondiabetics in a study by Demayo et al (2009) [4].

They analyzed that there is a Facial asymmetry, drooping of the brow ridge, compression of the face towards center, downward folding of the skin in the area of the eyes in Diabetics without any sexual variation by Geometric Morphometrics by image analysis.

Moore SE et al (2001) [19] analyzed that Fetal alcohol syndrome (FAS) and Parietal Fetal alcohol syndrome(PFAS) have a facial dysmorphology which could be used for screening Prenatal exposure to alcohol. They had taken total 131 study population amongst which 100 were cases (41 FAS, 59 PFAS) and 31 control group for study amongst which 6 craniofacial dysmorphology have been explored.

McGrath J et al (2002) [15] have found effective distinguishing features in Psychotic disorder such as in schizophrenia, there is smaller temporal lobes in patients as comparable to controls based upon Anthropomorphic study. They have recruited 310 cases and 303 controls and analyzed that Psychotic disorder found to be more in wider skull base, protruding ears, shorter and wider palates.

Chandra HJ et al (2012) [1] have obtained Anthropometric disproportion between the local populations and American Caucasians. They have studied facial anthropometric measurement in 50 males and 50 females of adult age group belonging to same ethnic group. They had used standard anthropometric landmarks for Anthropometric measurements and indices.

Solon ECC et al (2012) [20] have surveyed geometric morphometrics by Image Analysis amongst hypertensive and non-hypertensive and have come to a conclusion that there is facial dysmorphology between hypertensive and non-hypertensive patients.

Batiha AM (2015) [21] et al tried to find any correlation between hypertensive population of Jordia and their anthropometric indices. They have included hip circumference, waist circumference, height, weight, waist-to-hip ratio, and a body shape index in their study.

Conclusion

Though the data analysis have not concluded any change in facial anthropometry in hypertensive subjects with affirmation but the data obtained for control subjects in Central Indian Population can further be utilised by Anthropometrics, Forensic Experts, Anatomists and Plastic surgeons too. More firmly conclusion can be drawn if study is carried out further with larger number of subjects.

Conflicts of Interest

There are no conflicts of interest in this study.

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