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# CHALENGES OF ANTHROPOMETRIC MEASUREMENTS IN HUMAN FACE

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## ABSTRACT

Face anthropometry refers to the measurement and analysis of the dimensions, proportions, and features of the human face. It involves the quantitative assessment of various facial parameters, such as distances, angles, and ratios, to study the variability and characteristics of facial structures in different populations. Aims of study to investigate the variations in anthropometric measurements of the human face across different age groups, to explore the possible histological, anatomical, and developmental factors contributing to these changes in facial measurements and to provide calibration of anthropometric measurement between normal and aging patient. The study population consisted of 120 healthy female adults person, aged between (20 – 54) years, who were divided into three age groups: (40) person of (20-29) years old, (40) person of (30-39) years old, and (40) person of (40-54) years old. The anthropometric measurements were taken using a digital sliding caliper to measure Bizygomatic distance(mm), Bigonal distance (mm) and the length of the chin(mm).The result of current study showed that mean of bizygomatic distance, bigonal distance and length of the chin decreased with age. Facial expression measurement was reduced with increase age that reflect the face become more narrower and shorter.

**Key word: Anthropometry, Bizygomatic distance, Bigonal distance and the length of the chin**

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## INTRODUCTION

Anthropometric measurements of the human face refer to the systematic quantitative measurements of the different dimensions of the face. These include measurements of the size, proportions, and physical characteristics of different facial features. The tissues including our skin, fat, muscle, and even bones atrophy over time. Tissues that were once plump and full become deflated over time. the result of volume loss is a hollowed, deflated appearance (Chandra *et al*., 2012).

Skeletal aging begins after peak bone mass is reached; progressive bone loss then occurs. Peak bone mass may occur at different ages in different skeletal sites and varies between sexes. Accelerated loss of bone occurs in the perimenopausal period in women, whereas more gradual but progressive loss of bone occurs in aging men. Changes in bone quality as well as bone quantity occur during growth and subsequent aging. These include changes in bone microarchitecture which may differ between cortical and trabecular compartments and in different sites, and may impact on bone size and geometry (Goltzman, 2019).

Physiological changes in aged skin include structural changes, which revealed the number of cell layers remains stable, but the skin thins progressively over adult life at an accelerating rate. The epidermis decreases in thickness, particularly in women and particularly on the face, neck, upper part of the chest, and the extensor surface of the hands and forearms. Keratinocytes, as skin ages, change shape, becoming shorter and fatter, while corneocytes become bigger as a result of decreased epidermal turnover. Thickness decreases about 6.4% per decade on average, with an associated reduction in epidermal cell numbers (Farage *et al*., 2013)

## MATERIALS AND METHODS

Observational cross-sectional study was conducted at the University of Ahl al-Bayt Collage of Dentistry. The study population consisted of 120 healthy female adults person, aged between (20–54) years, who were divided into three age groups: (40) person of (20-29) years old, (40) person of (30-39) yearsold, and (40) person of (40-54) years old. The participants were selected using convenient sampling methods from different cities in the local region.

The anthropometric measurements were taken using a digital sliding caliper with a precision of 0.01 mm. The measurements were taken by two trained and calibrated examiners, who conducted all measurements twice to reduce the chances of inter- and intra-examiner variability.

The following measurements were obtained for each participant:

1. **Frontal View Measurements**: Bizygomatic distance, Bigonal distance.

2. **Lateral View Measurements**: Length of Chin.

The measurements were then compared to control values obtained from (Flávio, 2020). Which were as follows:

• Bizygomztic distance(mm) = 121

• Bigonal distance (mm) = 110

• length of the chin(mm) = 45

## RESULTS AND DISCUSSION

1. Comparison the anthropometric frontal and lateral measurement between study age groups:

The age group differences offer valuable insights into the variation of anthropometric measurements across different age groups. The sample was divided into three age groups: 20-29 years (n=53), 30-39 years (n=35), and 40-54 years (n=31). The mean values and standard deviations of the anthropometric measurements were calculated for each age group, providing a detailed comparison of facial measurements across the different age categories.

1-1 Frontal View Measurements:

• Bizygomztic distance (mm): The result of current study showed that mean bizygomztic distance decreased with age, from 115.5 mm in the (20-29 years) age group to 97.6 mm in the (40-54 years) age group (table 1). This suggests that the distance between the two zygomatic bones may be narrower with age.

• Bigonal distance (mm): The result of current study showed that mean bigonal distance decreased slightly with age, from 95.7 mm in the (20-29 years) age group to 92.5 mm in the (40-54 years) age group (table 1). This indicates that the distance between the two gonion points on the mandible may be narrower with age.

**Table 1:** Descriptive statistics of anthropometric frontal view measurements among age study groups :

| Index | | Bizygomatic distance (mm) | | Bigonal distance (mm): | |
|---|---|---|---|---|---|
| Age | N | Mean | SD | Mean | SD |
| 20-29 | 40 | 115.5 | 21.9 | 95.7 | 12.7 |
| 30-39 | 40 | 108.0 | 20.7 | 93.9 | 8.2 |
| 40-54 | 40 | 97.6 | 18.7 | 92.5 | 13 |

1-2 Lateral View Measurements:

•Length of the Chin (mm): The result of current study showed that mean chin measurement decreased with age from 57.7 mm in the (20-29 years) age group to 50.5 mm in the (40-54 years) age group (table 2). This pattern suggests that the chin may be reducing in size and length with age.

**Table 2:** Descriptive statistics of anthropometric lateral view measurements among age study groups:

| Index | | Length of chin | |
|---|---|---|---|
| Age | N | Mean | SD |
| 20-29 | 40 | 57.7 | 9.9 |
| 30-39 | 40 | 56.0 | 5.7 |
| 40-54 | 40 | 50.5 | 8.4 |

2. Comparison the anthropometric frontal and lateral measurement between study group and control group by using T – test.

The results of this study showed that there were the mean values of frontal and lateral measurement variables were highly significantly higher($p<0.01$), than mean value of frontal and lateral measurement variables control group (table 3).

**Table3**: Comparison the mean difference of anthropometric measurement between control group and study group by using T – test.

| Index | N | Mean difference | Std. Deviation | P value |
|---|---|---|---|---|
| Bizygomatic distance (mm) | 119 | 115.20 | 22.91 | < 0.00 HS** |
| Bigonal distance (mm) | 119 | 94.35 | 11.52 | < 0.00 HS** |
| Length of chin (mm) | 119 | 55.16 | 8.25 | < 0.00 HS** |

**HS: **Highly significant P value <0.001**

The changes in facial anthropometric measurements observed across different age groups may be explained by several factors, encompassing histological, anatomical, and developmental aspects:

**Histological Factors:** Histological changes involve the gradual loss of skin elasticity, collagen, and subcutaneous fat as we age. The skin's natural aging process leads to a decline in facial feature fullness and firmness, which in turn impacts anthropometric measurements ***(Ross & Pawlina, 2011)***. The reduction in collagen and other structural components of the skin can result in these noticeable changes ***(Farage et al., 2010).***

**Anatomical Factors:** From an anatomical viewpoint, the facial skeletal structure also evolves with age. The maxilla and mandible, which significantly determine bizygomatic and bigonal distances, respectively, undergo resorption over time. This process results in a decrease in bone mass and alterations in bone structure, contributing to the variations seen in facial measurements across different age groups ***(Gray's Anatomy, 2016).***

**Developmental Factors:** Developmentally, facial changes continue throughout adulthood. Facial muscles may experience atrophy or hypertrophy due to lifestyle factors, like diet and exercise, or health conditions. These changes can impact frontotemporal distance, width of the nose, nasal bridge, length of the nose, and chin measurements ***(Gray's Anatomy, 2016).***

**Environmental and Lifestyle Factors:** Long-term exposure to environmental factors, including sun damage and pollution, along with lifestyle habits like smoking or a poor diet, can accelerate the aging process, resulting in earlier and more pronounced changes in facial measurements ***(Farage et al., 2010).***

The result of this study showed that there were decrease in bizygomatic and bigonal distances with age that ***agree with (Pessa and Chen, 2002)*** and (***Kahn and Shaw .2008)***, which reported similar alterations in the bony orbit with aging. Age-related changes in the periocular areas are mainly caused by anatomic changes of the bony orbit and orbicularis oculi muscle.

Also, ***Mendelson et al. (2007)***, who noted age-related changes in the orbit and midcheek where the angle between the anterior maxillary wall and the orbital floor was found to have a statistically significant decrease with advancing age among both sexes. Which reported elongation of the lower eyelid caused by infraorbital hollowing, flattening of the malar eminence, and increased prominence of the nasolabial fold) are attributable to gravitational migration of the check fat or to fat atrophy.

***(Bartlett et al. 1981)*** and ***(Behrents 1985)*** suggested that the craniofacial skeleton undergoes significant changes throughout adulthood due to aging process and developmental variation specially in the body of mandible that agree with their result regarding to decrease the chin length.

## CONCLUSION

The study provided evidence of significant variations in facial anthropometric measurements across different ages. Certain measurements, such as bizygomatic distance and bigonal distance seem to decrease with age. The chin measurement was found to significantly decrease with age. This concluded that facial expression was become more narrower and shorter with age.

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