ASSOCIATION BETWEEN BODY MASS INDEX AND FACIAL DIMENSIONS

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INTRODUCTION

- Facial morphology

  (Maalman *et al.*, 2007).

- Identification – race and sex

  (Moore *et al.*, 2010).

- Forensic application

  (Jain *et al.*, 2012; Al-Kawaz *et al.*, 2018).

PRESENT STUDY

- Few studies on factors that affects facial parameters globally

  (See *et al.*, 2008).

- Facial parameters association with body mass index

  (Gunes *et al.*, 2015; Surmeli *et al.*, 2019).

AIM

To determine the association between selected facial dimensions and body mass index.

SPECIFIC OBJECTIVES

- To measure the facial dimensions of the participants.
- To determine the body mass index of the participants.
- To determine the prevalence of obesity amongst males and females.
- To ascertain whether body mass index has an effect on facial parameters.

MATERIALS AND METHODS

- **Study Design and Location**
  - Location: Anatomy Department -SMD, KNUST.
  - Sample size: 274 (58.4% males and 41.6% females).
  - Duration : September 2018 to April 2019.
  - Informed participant consent and ethics committee approval.

MATERIALS AND METHODS

- Inclusion criteria:
  - Age range – 16-34 years.
  - Healthy participants.

- Exclusion criteria:
  - facial deformities.
  - vertebral column deformities.
  - Participant without edema.

MATERIALS AND METHODS

- **Measurements**
  - 26 facial dimensions
    - Body mass index $= \frac{\text{weight (kg)}}{\text{height (m)}^2}$

(Nuttall, 2015).

- Materials:
  - Digital veniers calliper (Shangai, China).
  - Dritz C-150 fibre glass measuring tape (USA).
  - Shahe height meter (Shanghai-China).

- **Data analysis** – SPSS version 20.0, Inc. Chicago, USA.

MATERIALS AND METHODS

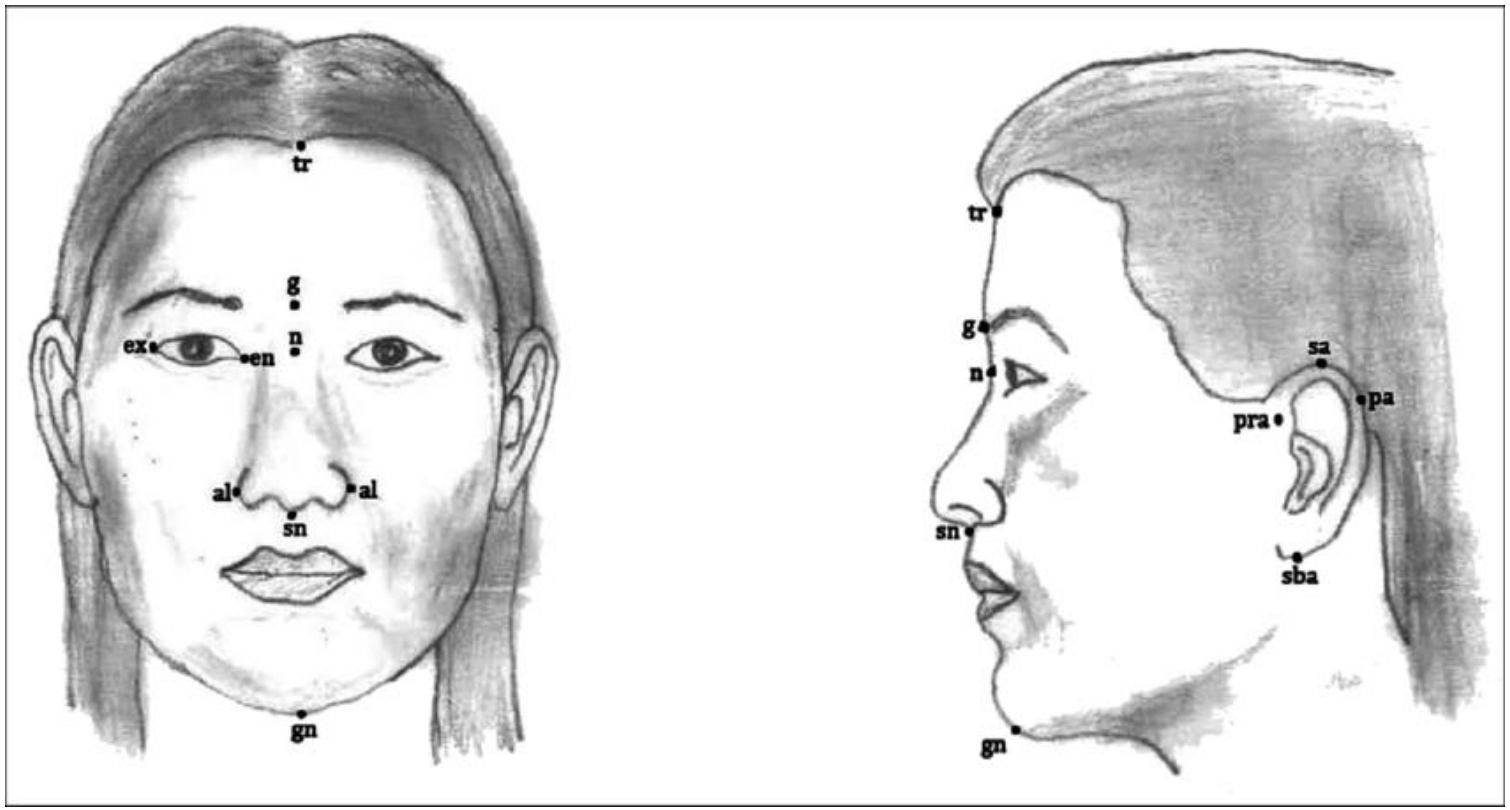

Figure 1: A drawing showing the facial landmarks for measurements: ***al*** *(alar),* ***en*** *(endocanthion),* ***ex*** *(exocanthion),* ***g*** *(glabella),* ***gn*** *(gnathion),* ***n*** *(nasion),* ***pa*** *(postaurale),* ***pra*** *(preaurale),* ***sa*** *(superaurale),* ***sba*** *(subaurale),* ***sn*** *(subnasale),* ***tr*** *(trichion),* ***ch*** *(cheilion),* ***ex*** *(exocanthion),* ***t*** *(tragion).*

(Source: Mohamed *et al.*, 2014).

MATERIALS AND METHODS

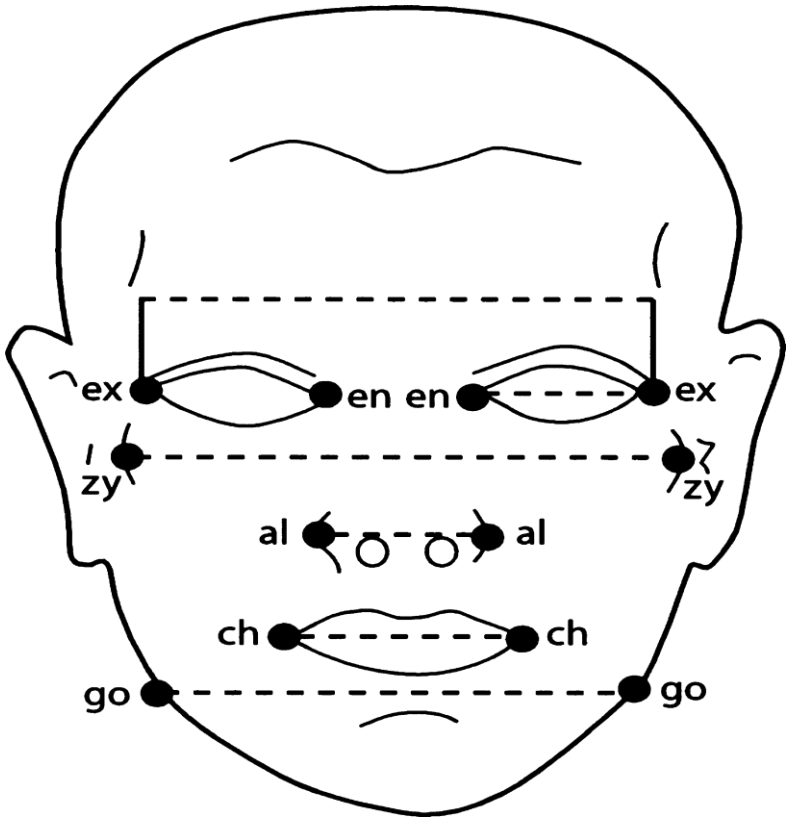

Figure 2: A diagram showing the measurements of the frontal aspect of the face*:* ***en-en*** *(intercanthal width),* ***ex-ex*** *(biocular width),* ***en-ex*** *(eye fissure length),* ***zy-zy*** *(face width), go-go (mandibular width),* ***al-al*** *(morphological nose width),* ***ch-ch*** *(mouth width)* (Source: Farkas *et al.*, 2005).

RESULTS AND DISCUSSION

- Table 1: Prevalence of obesity amongst males and females.

BMI			N	% within BMI
Obese		Male	1	10.0
		Female	9	**90.0**
	Total		10	100.0
Overweight		Male	16	34.8
		Female	30	**65.2**
	Total		46	100.0
Healthy weight		Male	129	65.8
		Female	67	34.2
	Total		196	100.0
Underweight		Male	14	63.6
		Female	8	36.4
	Total		22	100.0

***N** = Number of Participants; **BMI_CAT= Categorized Body Mass Index Statistically Significant Difference (P < 0.05); Obese** = 30 - 39.9; **Overweight** = 25 - 29.9; **Healthy weight range** = 18.5 - 24.9; **Underweight** = <18.5*

(Consistent with Ofori-Asenso *et al.*, 2016).

RESULTS AND DISCUSSION

Table 2: Comparison of body mass index and the Bitragal Width .

	BMI	Mean ± SD (cm)	Range (cm)	p-value
T-T	Obese	29.61 ± 1.07	27.50 - 31.10	
	Overweight	29.70 ± 1.15	26.80 - 32.10	**0.045***
	Healthy weight	29.48 ± 1.21	26.00 - 32.50	
	Underweight	28.83 ± 1.17	26.20 - 30.70	
	Total	29.47 ± 1.20	26.00 - 32.50	

SD** = Standard deviation; **N** = Number of Participants; **cm** = centimetre; **T-T=Bitragal width**; * = **Statistically Significant Difference (p < 0.05).

RESULTS AND DISCUSSION

Table 3: Comparison of body mass index and bizygomatic breath.

	BMI	Mean ± SD (cm)	Range (cm)	p-value
ZY-ZY	Obese	13.30 ± 0.58	12.11 - 14.18	
	Overweight	13.10 ± 0.74	11.13 - 14.94	**0.004***
	Healthy weight	12.84 ± 0.97	9.92 - 15.25	
	Underweight	12.31 ± 0.95	10.51 - 14.64	
	Total	12.86 ± 0.94	9.92 - 15.25	

SD = *Standard deviation;* ***N*** = *Number of Participants;* ***cm*** = *centimetre;*
ZY - ZY = *zygion to zygion;* * = ***Statistically Significant Difference (p < 0.05).***

Figure 3: A picture showing a change in facial morphology due to fat loss.

(Source: https://www.dailymail.co.uk/femail/article-5175065/Transformations-weight-loss-does-face.html).

Figure 4: A picture showing a change in facial morphology due to fat loss.

(Source: https://www.dailymail.co.uk/femail/article-5175065/Transformations-weight-loss-does-face.html).

RESULTS AND DISCUSSION

Table 4: Correlation of body mass index with facial parameters.

BMI		TR-G	N-ST	G-SN	T-T
OV	r	0.104	-0.165	-0.104	0.089
	p-value	0.444	0.223	0.445	0.516
HW	r	0.054	**0.142***	**0.159***	**0.225****
	p-value	0.452	**0.047**	**0.026**	**0.002**
UW	r	**0.468***	-0.096	-0.300	0.008
	p-value	**0.028**	0.672	0.175	0.973

Bitragal width = *(t-t);* ***facial height I=*** *(tr-g);* ***left Maxillary depth*** = *(Lt-sn);* ***G-SN =*** *gnathion-subnasale;* ***N-ST =*** *nasion-stomion** = ***Statistically Significant Difference (p < 0.05)****;* ***OV =*** *above healthy weight participants;* ***HW =*** *healthy weight;* ***UW =*** *Underweight.*

RESULTS AND DISCUSSION

Table 5: Correlation of body mass index and facial parameters.

BMI		T-T	LT-EX	RT-EX	LT-SN	RT-SN	LT-CH	RT-CH	LT-GN	RT-GN
OV	r	0.089	0.033	-0.002	0.071	-0.016	0.204	0.123	0.029	0.031
	p-value	0.516	0.808	0.988	0.601	0.905	0.131	0.365	0.833	0.822
HW	r	**0.225***	0.098	0.071	**0.171***	**0.150***	**0.224***	**0.242***	**0.211***	**0.210****
	p-value	0.002	0.171	0.325	0.017	0.036	0.002	0.001	0.003	0.003
UW	r	0.008	-0.052	-0.177	-0.150	-0.123	-0.171	-0.313	0.047	-0.033
	p-value	0.973	0.819	0.432	0.506	0.584	0.446	0.156	0.836	0.886

Bitragal width *= (t-t);* ***Orbital depth =*** *(t-ex);* ***left Maxillary depth*** *= (Lt-sn);* ***Right Maxillary depth*** *= (Rt-sn);* ***Mid-cheek depth =*** *(t-ch);* ***Mandibular depth*** *= (t-gn);** = **Statistically Significant Difference (p < 0.05)**;* ***OV =*** *above healthy weight participants;* ***HW =*** *healthy weight;* ***UW =*** *Underweight.*

CONCLUSION

- More female participants were obese and overweight than the male participants.

- A change in one's body mass index can have a corresponding effect on his/her bitragal width and bizygomatic width.

FUTURE WORK

- A larger sample size should be used in future studies to increase accuracy of prediction.

- Standardized facial photographs should be employed to minimize random error during the measurement of facial parameters.

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THANK YOU