

FACIAL PROFILE AMONG JIMMA UNIVERSITY MEDICAL FACULTY OROMO STUDENTS, JIMMA UNIVERSITY INSTITUTE OF HEALTH, JIMMA, SOUTHWEST ETHIOPIA

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By Dr.AmsalMerga (DMD, Orthodontic resident)

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A RESEARCH PAPER TO BE SUBMITTED TO JIMMA UNIVERSITY, INSTITUTE OF HEALTH, FACULTY OF MEDICAL SCIENCES, DEPARTMENT OF DENTISTRY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS OF SPECIALITY IN ORTHODONTICS

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AUGUST/2022

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By Dr.AmsalMerga (DMD, Orthodontic resident)

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Advisor:

Dr.MulualemTolesa (DMD, Assistant Professor of Orthodontics)

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ABSTRACT

Background: -An aesthetically pleasing and balanced face is one of the objectives of orthodontic treatment. An understanding of the soft tissues and their normal ranges enables a treatment plan to be formulated to normalize the facial traits for a given individual.

Objective: -The aim of this study was to obtain objective average measurements of the soft tissue facial profile of Oromo medical students of Jimma University to use them as a guide for aesthetic treatment goals. Additionally, gender differences were tested.

Method: An Institutional based cross-sectional study design was conducted using photometric measurements to determine the average values of facial profiles by angular measurements. Data are reported as mean \pm SD for continuous variables with normal distributed and median (interquartile range) with non-normal distributed variables.

Results and discussion : A facial profile of 100 Jimma University Oromo Medical students was assessed. Out of these 52 of the participants were males. Statistical significance difference were found in angle of facial convexity(males= 171.10 \pm 6.8; females 170. 5 \pm 0.28) compared to Caucasian population and other Africans . There was no significant sex difference on facial convexity.

Conclusion: In our study, the facial profile of Oromo medical students is moderately convex compared to Caucasian population and less convex compared to other black African population, such as Nigeria.

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ACKNOWLEDGMENT

First and foremost, I would like to thank Jimma University's Institute of Health, Department of Dentistry, for providing me with the opportunity to conduct this thesis. My deepest thanks go to my advisor, Dr. Mulalem Tolesa (Assistant Professor, orthodontist), for his unreserved, timely, and continuous support.

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CHAPTER ONE

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Introduction

1.1 Background:

The main goal of orthodontic treatment is to maintain or improve facial attractiveness as much as possible. Patients often attach more importance to esthetic results than to the outcome of malocclusion treatment. Hence, facial profile beauty has been the object of several studies that focused on identifying the features that had a major impact on facial beauty.

The perception of an appealing face is basically subjective, with ethnicity, age, gender, way of life, and personality influencing common facial developments (2). Facial functions are typically studied in profile. Various methods have been used to evaluate facial characteristics, such as anthropometry, photogrammetry, computer imaging, and cephalometry .

Evaluation of the patient's soft tissue profile is one of the most important components of orthodontic diagnosis and treatment planning. The analysis of the soft tissues should be taken into consideration for the correct evaluation of an underlying skeletal discrepancy because of individual differences in soft tissue thickness (5)

To interpret the diagnostic information provided by lateral cephalograms .Numerous analyses have been developed ; and most reports on dento facial changes have been based on cephalometric data(6). Furthermore, patients are not accustomed to viewing and interpreting cephalograms or their tracings. However, in cephalograms, the soft tissue structures are recorded only in profile and limited to the anterior-most outline. Photographs, on the other hand, provide a more conventional documentation of the soft tissues of the face (7).

Other photographic methods to quantify facial aesthetics have also been used, Different authors have included soft tissue parameters in photogrammetric and various soft tissue facial analyses based on standardized photogrammetric method have been described (8,9).(10,11) .

1.2 Statement of the problem

All medical specialties interested in improving facial appearance want to measure the face to quantify the favored facial changes; the evaluation of the soft tissue facial profile from photographic records provides information on the morphology of the profile and its relationship with the underlying dent skeletal tissues.

The purpose of these investigations to obtain objective average measurements of the soft tissue facial profile to use them as a guide for aesthetic treatment goals. The role of soft tissue in orthodontic analysis and treatment planning is increasing and soft tissue is taken into consideration as the primary challenge of treatment, and the most crucial component in measuring the treatment success rate.

Orthodontists align the anterior tooth cautiously based on the patient desire that makes Facial profile a crucial effect on facial profile aesthetics. Numerous researchers set out to quantitatively assess which soft tissue relationships would possibly make contributions to or detract from facial harmony and esthetics and to explain how these records will be used in orthodontic treatment planning. However, most classical cephalometric standards have been based on sample populations with European or American ancestries and these norms may not be appropriate for the diagnosis and treatment planning of patients from different ethnic or racial backgrounds.

Understanding of the normal dent-facial pattern for every ethnic group might tend to enhance treatment success and to establish ideal facial harmony. Such investigations have shown considerable variations among the ethnic and racial groups studied in comparison with Europeans and Americans. Except, with the increasing number of Jimma communities' seeking specialized treatment from orthodontists, it might be beneficial to decide what constitutes a pleasant and esthetic face for this population. The present study aimed to increase photographic soft-tissue norms which can help in orthodontic diagnosis and treatment schedules for young Jimma adult males and females. Consequently, in this study, we will determine facial profile norms in normal occlusion.

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1.3 Significance of the study

This study has assessed facial profile which is very critical in orthodontic treatment plan. Facial profile has become one of the most important soft tissue analyses, as it influences the occlusion, tooth stability and facial aesthetics. Moreover, orthodontic treatment plan can alter facial profile. As the study sheds light on the status of facial profile of our community, it will assist an orthodontist in diagnosis and treatment planning.

To the best of the researcher's knowledge, this study is the first of its kind at the study area, in particular, and in Ethiopia in general. Hence, the study can also be used as initial point of entry for the subsequent studies which will be conducted in the future.

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CHAPTER TWO

LITERATURE REVIEW

Study done among Chinese high school students showed the average male student's facial profile angle measured using Grabber method was 153.49° with SD of 8.37° whereas the average female student's facial profile angle was 157.19° with a standard deviation of 8.1° . The average facial profile angle measured using the Singh method was 171.05° with a standard deviation of 5.52° for males, whereas that of females was 171.6° with a standard deviation of 5.56° .

The Facial profile distribution based on gender using the Grabber method showed 62% of males and 68% of females students had the straight profile, followed by the convex profile which comprised 20% of males and 16% of females. 18% of males and 16% of females had concave profile with the lowest percentage.

The facial profile distribution based on gender using the Singh method showed 70% of the males and 62% of the females students had the straight profile, which was comprised of 70% of the males and 62% of the females followed by the concave profile comprised of 8% of males and 22% of females.

The convex profile had the lowest percentage among which was 14% of males and 22% of females ($p > 0.05$). The differences between the Grabber and Singh methods for the facial profile analysis by photometry as examined by Fisher's exact test ($p = 0.004$). (Facial Profile Analysis by Photometry on W. R. Supratman 1 & 2 Chinese High School Students in Medan)

According to the study done in Croatia, four angles showed gender differences: nasofrontal (G–N–Nd, $P = 0.030$), nasolabial (Cm–Sn–Ls, $P = 0.018$), mentolabial (Li – Sm – Pg, $P = 0.019$), and nasal tip (N–Prn–Cm, $P = 0.001$). All angles that suggested gender differences were wider in females: nasofrontal (G–N–Nd females = 139.11 ± 6.35 degrees, males = 136.38 ± 6.71 degrees), nasolabial (Cm–Sn–Ls females = 109.39 ± 7.84 degrees, males = 105.42 ± 9.52 degrees), mentolabial (Li–Sm–Pg females = 134.50 ± 9.08 degrees, males 129.26 ± 9.55 degrees), and nasal tip (N–Prn–Cm females = 84.12 ± 5.20 degrees, males 79.85 ± 6.36 degrees). The greatest

variability was found for mentolabial angle, which had the highest standard deviation. The nasolabial and mentolabial angles showed the highest method error (1.5–2.5 degrees). (Anić-Milošević S, Lapter-Varga M, Šlaj M. Analysis of the soft tissue facial profile by means of angular measurements. *The European Journal of Orthodontics*. 2008 Apr 1;30(2):135-40.)

Study done in Indonesia Using Grabber's method showed the mean value of male students facial profile angle was 154.17° with a standard deviation of 9.35° whereas the mean value for female students was 156.25° with a standard deviation of 8.07° . Facial profile distribution based on gender of both male and female students using Grabber's method showed, straight facial profile had the highest percentage in this study which was 68% on males and 60% on females followed by convex facial profile which was 18% on males and 22% on females. Concave facial profile had the lowest percentage in this study which was 14% on males and 18% on females, $p > 0,05$ showed that there were no significant differences between the facial profiles of males and females . (Lubis HF, Lubis MM, Bahirrah S. The facial profile analysis of adolescents in Medan. *Journal of International Dental and Medical Research*. 2018 Sep 1;11(3):967-70.)

A study done in Nigeria among Ibo males have higher facial angles than the females. The mean facial angles of Ibo male and female subjects were 83.1 with SD of 4.1 and 81.1 with SD of 5.2 degrees, respectively. A significant difference was found between Ibo males and females in the facial angle ($P < 0.05$). The facial angle increased significantly with age ($P < 0.05$). (Ese A, Richard O. PHOTOMETRIC ANALYSIS OF THE FACIAL ANGLE OF THE IBOS IN NIGERIA. *African Journal of Cellular Pathology*. 2014;2(1):1-6.)

The study conducted in Nepal showed Mean value for anterior-posterior relationship of upper and lower lip judged by E-line were -3.78 ± 0.67 mm and -1.92 ± 0.61 mm respectively whereas upper and lower lip judged by S-line were 0.18 ± 0.58 mm and 0.06 ± 0.44 mm respectively . S

Regarding angular measurement, out of 7 angular measurements, four parameters show gender differences which means statistically significant ($p < 0.001$) difference were seen in Nasofrontal angle (M: 133.160 ± 2.870 ; F: 140.660 ± 1.240), Nasolabial angle (M: 104.330 ± 0.980 ; F: 110.010 ± 1.490), Mentolabial angle (M: 129.320 ± 1.100 ; F: 134.0 ± 1.270) and Nose tip angle (M: 105.480 ± 0.750 ; F: 110.500 ± 1.500) were larger in females. (Karki A. Photographic Analysis of Aesthetically Pleasant Facial Profile in Aryan Group of Nepalese Population. European Journal of Medical Sciences. 2020 Dec 30;2(2):51-7.

According to study done in Bangladesh The average angular measurements for different parameters of sample showed that the greatest variability was found for mentolabial angle, which had the highest standard deviation. Statistically significant gender differences were found for two angles - nasofrontal angle (G-N-Nd, $P = 0.000$) and mentolabial angle (Li-Sm-Pg, $P = 0.001$).

In this study, most of the angles such as nasofrontal, total facial, facial, upper lip, lower lip to chin, and mentolabial were wider in females than males. Whereas nose tip angle, nasolabial angle, nasomental angle, and upper lip to chin angle were higher in males compared to females. (

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The skeletal relationship of the sample included 143 subjects (67.7%) with a Class I, 61 subjects (28.6%) with a Class II, and eight individuals (3.7%) with a Class III relationship. Sixty-nine subjects (33%) had received previous orthodontic treatment.

The Student's *t*-test was applied to all variables to determine the influence of sex in the measurements (Table 1). Five of the angles showed sexual differences: nasofrontal (G-N-Prn, $P = 0.001$), nasal (Cm-Sn/N-Prn, $P = 0.009$), vertical nasal (N-Prn/TV, $P = 0.002$), nasal dorsum (N-Mn-Prn, $P = 0.035$), and cervicomental (C-Me/G-Pg, $P = 0.000$).

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CHAPTER THREE

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OBJECTIVES

3.1. General Objective

To assess facial profile of Jimma University Oromo medical students by angular measurement using photo-metric analysis ,from July 9 to July 15,2022,South West Ethiopia

3.2. Specific objectives

- To establish lateral facial profile norms for Jimma University Oromo medical students
- To identify possible gender differences between Jimma University Oromo medical students
- To compare the derived norms with the previously set norms for the Caucasian population.

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CHAPTER FOUR

METHODS AND MATERIALS

4.1. Study area and period

The study was conducted at Jimma University which is located in Jimma town, Oromia regional state, Southwest Ethiopia, at a distance of 352 km from the capital city, Addis Ababa. Jimma University (JU) is a public research university located in Jimma, Oromia Region, Ethiopia. The study was conducted from July 09/2022 to July 15/2022. It is recognized as the leading national university, as ranked first by the Federal Ministry of Education for four successive years (2009-2012)...

4.2. Study design

An institutional based cross-sectional study was employed.

4.3.2 Study population

Jimma university medical Oromo students

4.3.3 Eligibility criteria

4.3.3.1 Inclusion criteria

- All medical students, aged 18 -25 years
- Complete dentition, third molars disregarded
- Dental Class I occlusion with normal over jet and overbite
- Minimal spacing and crowding
- Balanced facial profile and competent lips
- Normal skeletal relationship

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4.3.3.2 Exclusion criteria

- Age<18years and >25 years
- Dental class II and class III students
- Patients who have history of orthodontic treatment or facial surgery
- Adolescents with obvious skeletal abnormalities or syndromes

4.4. Sample size determination and sampling technique

4.4.1 Sample size determination

The sample size was calculated using the single population proportion formula (because the study is aimed to develop norm of the study participants) assuming

$$n = (Z\alpha)^2 (\delta)^2 / e^2$$

Where, n=desired number of samples

Z α = Standardized value for the corresponding level of confidence

e = Margin of error or rate of precision

σ = SD which is based on previous study or pilot study

$$\text{Precision} = 1.96(6.544/102)$$

$$\text{There for} = (1.96)^2 (6.544)^2 / (1.28)^2$$

$$n = (3.84)(42.8)/1.64$$

$$n = 164.4/1.64$$

$$n = 100$$

4.4.2 Sampling technique

Simple random sampling method was used to select the study participants from medical faculty registration data.

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4.5. Data collection procedure

Lateral profile photos with the whole of the right side of the face clearly visible was taken. The photos were taken with a digital camera. To capture the patient's profile, he/she was placed against a neutral background, at a large enough distance so that no shadows are formed. The photographs were taken in a natural position of the head (NHP), which were obtained by placing a mirror in front of the subject at a distance of 120 cm, the patients were asked to look into their own eyes in the mirror, with relaxed lips and their forehead and ears visible. The camera was placed horizontally on an adjustable tripod according to each patient's height. The photographic records were then analyzed.

The following cutaneous points were marked on the photographs: Glabella (G), Nasion (N), Subnasale (Sn), Pogonion (Pg). The following angles were traced and measured: the facial angle G-Sn-Pg).

4.6. Study variable

4.6.1 Dependent variable

Facial profile

4.6.2 Independent variables

- Sex
- Age
- Ethnicity

4.7. Operational definition

1. Glabella (Gl), the most anterior point of the middle line of the forehead.
2. Soft Tissue Nasion (N), the most concave point in the tissue overlying the area of the

Fronto-nasal suture.

3. Subnasale (Sn), the point at which the nasal septum merges with the upper cutaneous lip
4. Pogonion (Pog), the most anterior point on the soft tissue chin.

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5. Soft tissue Menton (Me), the most inferior point on the soft tissue chin.

4.8. Data analysis procedure

Data were checked manually for completeness, Coded and entered into SPSS version 25 for analysis. Descriptive statistics were presented as mean± Standard deviation for normal distributed data. The results were expressed as mean ± standard deviation (SD) for continuous variables and frequency (%) for categorical variables.

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4.9. Ethical consideration

Ethical clearance was obtained from the institution review board of Jimma University, Institute of Health. An official letter of cooperation and permission request to medical faculty were obtained. Informed verbal and written consent were taken from the study participants before the interview.. Participation in the study was entirely voluntary and the right of participants to withdraw from the interview or not to participate were respected. Data confidentiality was kept at all stages of data processing

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4.10. Dissemination plan of results

The findings of the study will be submitted to Jimma University Postgraduate School. Copies of the paper will be submitted to the Dentistry Department, JMC. The results of the study will be communicated with stakeholders through presentations on meetings, workshops and scientific panels. Finally, attempts will be made to publish the work on peer-reviewed journal to make accessible to all individuals.

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Table 2. Angular measurement and sex of the study participants among Jimma University Oromo Medical students, July 2022.

Cases	Included			Excluded			Total		
	Mean	N	Std. Deviation	Mean	N	Std. Deviation	Mean	N	Std. Deviation
Report									
Angle measurement									
Sex of study participants									
male	171.0962	52	6.84853						
female	170.5000	48	4.28257						
Total	170.8100	100	5.74095						

DISCUSSION

Facial appearance is influenced by age, sex, race, and ethnicity . Most clinicians have concluded that there are significant differences between diverse ethnic and racial groups, indicating that normal measurements for one group should not be considered normal for every other race or ethnic group. Different racial groups must be treated according to their own characteristics [12].

Achieving an aesthetic change in the soft tissue profile after orthodontic treatment often is one of the main concerns of the orthodontic patient. The perception of beauty varies widely among all individuals of different races and ethnic groups. Different authors have tried to quantify objectively their norms and ideas of the ideal facial profile]. The quantification and expression of the facial because of the diversity in races and ethnicity.

This study is designed to determine the facial profile in Angle's class I normal occlusion. The sample included adult subjects of age 18 to 25 years as the majority of facial growth is usually completed by 16 to 17 years of age . The subjects were selected from Jimma university medical students. Various methods have been used to evaluate the facial characteristics such as anthropometry, photogrammetry, computer imaging, and cephalometry.

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~~Among these methods, two dimensional photogrammetry has the advantages of being a basic, non-invasive, cost effective, and quick method that requires minimal time and equipment in the assessment of soft tissue.~~

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The average facial profile angle values of Jimma University Oromo medical students measured method The average facial profile angle of the male students was 171.0962 with a standard deviation of 6.84° whereas that of the female students was 170.81 with a standard deviation of 5.74°.

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~~Compared to north indian population our study result shows similarity.~~ The average facial profile angle of the male students was 171.05° with a standard deviation of 5.52°, whereas that of female students was 171.6° with a standard deviation of 5.56° This study differed from that of Mush et al. who sampled 150 (78 males and 72 females) subjects at Swami Vivekanand Subharti University, Meerut, north India with a range of 18–25 years and class I angle occlusions.

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That study was based on Arnett's method. The results showed that the Advances in Health Sciences Research, volume 4 248 average soft tissue facial angle for males was 168.54° with a standard deviation of 3.23° and 166.64° for females with a standard deviation of 4.09° [7]. The difference was caused by the different races examined between the studies.

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Adibah sampled 109 subjects of Malay ethnicity (54 males and 55 females) in her study conducted in Kuala Lumpur, Malaysia. This study was based on Arnett's method and the results showed that average facial profile angle for males was 166.91° with a standard deviation of 5.21° and 169.52° with a standard deviation of 4.6° for females [10].

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Cindy et al. conducted a study in Hong Kong, China with 278 subjects (166 males and 112 females). The results showed that the average facial profile angle of males was 168.10° with a standard deviation of 5.1° and that of females was 168.85° with a standard deviation of 4.83° [9].

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These results were not similar to those of the present study because the samples were taken from the different race. That study was based on the Logan and Burrstone method. The results showed that the convex facial profile was mostly found in males, and straight and concave had similar proportions. Straight, convex, and concave profiles comprised the same percentages in females [13]. The difference between these study results and those of the present study was caused by the different methods used.

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~~Our study result showed there is significant difference from Caucasian population. For Caucasian~~ These line segments ideally should form a nearly straight line, with only a slight inclination in either direction. A large angle between them (>10 degrees or so) indicates either profile convexity (upper jaw prominent relative to chin) or profile concavity (upper jaw behind chin).

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CHAPTER SIX

CONCLUSION

- The derived norms males= 171.10 ± 6.8 ; females The derived norms females = 170.5 ± 4.28 .
- The angular measurement shows moderately convex than normative value of Caucasian population.
- Facial profile is less convex than other black African population such Nigerians.
- There is no significant sexual dimorphism facial profile.

RECOMMENDATION

In view of the small samples reported in this study it is recommended that a bigger sample be obtained from the institutions involved in Orthodontics, Orthognathic surgery and craniofacial surgery to formulate a comprehensive data base.

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ANNEXES

Annex 1. ENGLISH QUESTIONNAIRE AND CONSENT FROM

Annex 1.2 Patient information sheet

Name of investigator: DrAmsalMerga (Ortho RIII)

Advisors: DrMulualemTolosa (DMD, Orthodontist)

Name of the study area: JimmaUniversity ,Institute of health , Jimma, South West Ethiopia

Research budget covered by: Jimma University

Research objective: to evaluate lateral facial profile, Jimma University, Institute of health , Jimma, South West Ethiopia

Study procedure: After granting consent from the subjects, intraoral examination was done for inclusion and exclusion criteria at the time of data collection. The examiner has transferred subjects to the principal investigator as per the inclusion and exclusion criterion. Principal investigator takes profile photograph of the subjects.

Risks: It is expected that the result of the study will not have any harmful effect on study of participant in any directions

Participant role; volunteerism and cooperation during Intraoral examination and photographic procedure.

Participant's right; taking part in this study is completely voluntary

Incentives: the study participant will not be provided any incentives

Confidentiality: any information of taken from the subjects and medical records would be completely confidential and the data stored without their name and only used for the purpose of this study

Contact if you have any kind of inconvenience about the study you can contact; DrAmsalMerga(Principal investigator), Telephone: 0922168084, amsalmerga3@gmail.com

Annex 1.3. Patient written informed consent form

Dear/sir/madam

My name is **Amsal Merga**. I am year three resident at Jimma university. I am going to do research on evaluation of horizontal facial profile at Jimma university institute of health ,medical faculty . Therefore, for the success of this research your willingness and cooperation is paramount. Any information from you would be completely confidential to the research and the data are stored without your name and only used for the purpose of this study. No identifying

names or characteristics will go into my report, so you may feel free. Additionally, taking part in this study is completely voluntarily. It is your choice whether to allow me using your medical records or not. I would be grateful if you could sign the attached form to say you have no objections to our accessing any records about you. Would you be willing to accept my request? Request accepted; Yes..... No..... If the individual responds “Yes” please proceed and let him/her to sign or if replies “No” gratitude him/her and quit the request.

Annex 1.3 data collection tool

Topic

Table 7.1 data collection format for research paper titled ‘facial ~~profile~~inprofile in adults with normal occlusion , JUIH, MF,

Jimma, South West Ethiopia.

A. sociodemographic characteristics

1. Age (years): _____

2. Sex: _____

3 .Ethicity_____