Determinants Factors for the Choice of the Width Prosthetic Upper Central Incisor: Review of the Literature

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Abstract

Materials and Methods: The authors conducted a review of the literature around the theme, determinants of the choice of the width of the upper central incisor (WUCI), through search web including Pub Med, Inari and Google. Fifteen of the most recent publications since 2005 have been selected from twenty publications. Sample size (n), age range (AR), average bizygomatic distance (BZD), choice determinants, type of study, and mathematical formula between WUCI and BZD were the study’s interest variables. Sociodemographic characteristics, facial anatomical marks and the size of the patient’s teeth for anterosuperior were the main factors to be assessed.

Results: Out of 22 included articles, the Asian continent represents 59% in which India is the leading country with 27.3% followed by American 22.8%. The most Determinants choice for the width upper central incisor in craniofacial and anterior teeth method from the published papers were BZD (100%; n = 22) and WUCI (81.8%; n = 18). Conclusion: Application of mathematical formulation maybe help to predict the exact width of the upper central incisor.

Keywords
Choice Determinants, Width, Upper Central Incisor, Prosthetic, Completed Edentulous
1. Introduction

The success or failure of prosthetic treatment depends in great part on the step of choosing the upper anterior teeth dimension [1]. The latter requires careful reflection and the arithmetic calculations of the practitioner [2]. On the other hand, it might need during the consultation; a series of anatomical constitutive unit or sociodemographic of the patient such as the shape of the face and nose, the color of the patient’s eyes, hair and skin, sex, personality and age [3]; as well as the ethnicity, race, region, continents, weight, etc. All of these factors maybe make the choice of the width of the top six anterior teeth (W6AT) or the upper central incisor (UCI) not only difficult [4], but also very complex. In addition, the genetic, hormonal, environmental, climatic, social and food factors of each individual as well as the customs of the population; may influence the craniofacial and dental dimension, especially in children population [5] [6]. In 1996, Hillson demonstrated in England that dietary factors could affect musculature and swallowing [7]. Antero-superior teeth are the key elements that contribute to the importance of aesthetic and beauty of dental facial [8]. It remain overrun the second position after the eyes in the appearance of the face [9]. The Upper Central Incisor (UCI) is considered as the star of all teeth; the most desired, cited and the most studied in relation to other teeth [10]. It is the most aesthetically pleasing tooth in the previous sector for its visibility in the mouth [11] [12].

In the case of complete edentulous in adulthood, especially in the absence of pre-extraction documents, the practitioner is called upon to make a judicious choice of one or whatever facial mark, and a series of aforementioned factors maybe help to determine either the width of an upper central incisor or the group of anterior teeth. To the best of our knowledge, no studies have been conducted in the Democratic Republic of Congo (RD Congo) about the determinants factors of choice of the width prosthetic upper central incisor. The aim of the study was to make an inventory of published articles about the determinants factors of choice for prosthetic WUCI in order to foresee the mathematical formulation between the WUCI and the BZD among the Congolese.

2. Materials and Methods

A review of the literature was performed in June 2020 using MEDLINE, PubMed, Scopus, Inari and Google. Keywords included the following terms: determinants, choice, width, upper central incisive, complete tooth. We selected the most recent articles of interest from 2005 to 2019. Reference lists of all articles retrieved from databases search were also selected for further relevant studies. Abstracts were reviewed and relevant articles were given more attention, and if possible, reviewed in full. Prospective or retrospective clinical studies, with a sample size of \( n \geq 5 \), in which the main focus was on data regarding age range, BZD average, WUCI selection determinants factors, and mathematical formula used between WUCI and BZD were evaluated and included in this review. Exclusion criteria were studies with unclear reporting of the aforementioned variables, nonhuman studies, letters, preface and comments. After the full
reading out of 25 articles, only 22 (88%) articles were included in the quantitative synthesis for the review.

3. Results

Out of 22 included articles, the Asian continent represents 59% in which India is the leading country with 27.3% followed by American 22.8% (Table 1). The most Determinants choice for the width upper central incisor in craniofacial method from the published papers were BZD (100%; n = 22) followed by ICOD (30%; n = 7) and WUCI (81.8%; n = 18) followed by ICCD (18.2%; n = 4) for anterior teeth method (Table 2). The average BZD is variable according to gender, race and ethnicity (Table 3).

4. Comments

The present research indicated that the most selected articles are in the Asian continent. Many authors have developed the choice techniques based on the proportions in Caucasian subjects [1] as well as for American publications. In Africa, however, there are insufficient studies maybe because of the different morphogenetic and typological observed in the maxillofacial area.

Determinant factors of the choice of the width of the upper central incisor (WUCI) are divided into three groups including socio-demographic factors, craniofacial and dental determinants factors. Age and gender are the most basic represented socio-demographic determinants in the literature. The sex is a factor that affect the width of the upper central incisor significantly and designates the smile [13]. However, typology is a support factor for age and sex. They affect the aesthetics and designates the smile [13]. However, typology is a support factor for age and sex that helps to create a pleasant-looking tooth [14]. Additionally, ethnicity and race are considered a complementary factor to gender, personality and age. An individual’s age, gender, typology, race, weight and body size could be called controllable socio-demographic determinants. Practitioners can easily classify and manage these factors. A statistical relationship between these factors and tooth width may be established. In addition, heredity, tribe, hormones, environment, ethnicity (R.D.C), etc. are uncontrollable determinants. They require a lot of administrative procedures, additional reviews, and proof of finances and

| Table 1. Breakdown of selected items by continent. |
|-----------------------------------------------|
| **Continents** | **Effective (Percentage)** |
|----------------|---------------------------|
| Asian          | 13 (59%)                  |
| American       | 5 (22.8%)                 |
| African        | 3 (13.7%)                 |
| European       | 1 (4.5%)                  |
| **Total**      | 22 (100%)                 |
Table 2. Determinants choice of the WUCI.

| Author            | Year  | Socio-demographic | Cranio-facial | Anterior teeth |
|-------------------|-------|-------------------|---------------|---------------|
| Hasanreisoglu et al. | 2005 | Sex, age          | ICOD, BZD, ID | WUCI, WULI, LULI, ICCD |
| Fabiana           | 2005 | Sex, age, race    | BZD           | WUCI, WULI, LULI, W6AT |
| Nagham            | 2005 | Sex, age, typology| BZD, DICE, ICD, IWD, ID, ICOD, IPD | WUCI, ICCD |
| Bamba et al.      | 2006 | Sex, age          | BZD, ID       | WUCI, ICCD |
| Umar et al.       | 2006 | Sex, age, typology, weight | BZD, ID, Skull, Tete | WUCI, ICCD |
| Oliveira's Strong | 2012 | Sex, age          | BZD, Na, Eu, Ba, Br, Glabelle Lambda, Inion, Mastoid | |
| Schuchita et al.  | 2012 | Sex, age          | ID, BZD, ICD, IWD | WUCI, ICCD |
| Bhashar et al.    | 2013 | Sex, age          | BZD           | WUCI |
| Jafari et al.     | 2014 | Sex, age          | BZD, ICOD     | WUCI |
| Gueye et al.      | 2014 | Sex, age          | BZD           | WUCI, UICD |
| Ankita            | 2015 | Sex, age          | BZD           | WUCI |
| Sameen et al.     | 2015 | Sex, age          | BZD, ICOD, IPD, ID | WUCI, W2UCI, ICCD |
| Khin et al.       | 2015 | Sex, age, ethnicity| BZD           | |
| Palathottungal et al. | 2015 | Sex, age          | BZD           | WUCI |
| Mohammed et al.   | 2017 | Sex, age          | BZD, ID, ICOD, DIC, ITD, FP, UIP | WUCI, LUCI, W6AT |
| Waseem et al.     | 2017 | Sex, age          | BZD, ID, ICOD | WUCI, LUCI, W6AT |
| Ewa et al.        | 2017 | Sex, age, ethnicity| BZD, IWD, ICD, | WUCI, W2UCI, W4UI |
| Shakir et al.     | 2017 | Sex, age          | BZD           | WUCI |
| Bhagat et al.     | 2018 | Sex, age          | BZD           | WUCI |
| Aead et al.       | 2019 | Sex, age          | DBZ, ID, ICCD, IWD | WUCI |
| Abitha et al.     | 2019 | Sex, age          | BZD           | WUCI |
| Debnath et al.    | 2019 | Sex, age          | BZD           | |

Legend: BZD: Bizygomatic distance; ID: Intercalar distance; ICD: Intercanthal distance; ICCD: Inter-commissure distance; ICOD: Intercondylar distance; UICD: Upper Intercuspidian distance; IPD: Interphillirum distance; IWD: inter ward distance; ITD: Inter tuberosity distance; FP: Fovea palatine; WUC: Width upper canine; W6AT: Width of the six anterior teeth; W2UCI: width of the two upper central incisors; W4UI: Width of the four upper incisors; WUCI: Width of the upper central incisor; WULI: Width of the upper lateral incisor; LUC: Length of upper canine; UIP: upper incisive papilla; NA: Nasion; EU: Euryon; BA: Basion; BR: Bregma.

time. Thus mean that it is very difficult, if not impossible, to use them as determinants factors, in order to determine the width of an upper central incisor (UCI). One might be tempted to apply the controllable socio-demographic dependent or independent variables in order to reach one or more mathematical formulas.

These determinants can be used in young adults (18 years) of age; because its growth has ended; and that the inter-dental contact points of incisive are still visible to the naked eye. The same is true for older people, although there is attrition or dental wear in the mouth [15] [16].

However, it should reserve for a child in times of growth. The skin and bone points of the face and the interdental points are unstable. This would not
Table 3. BZD average and WUCI formula.

| Authors and countries          | Year | BZD Average                              | Formula used                        |
|--------------------------------|------|------------------------------------------|-------------------------------------|
| Fabiana et al. (Brazil)        | 2005 | BZD (White) = 135.48 ± 7.73 mm           |                                     |
|                                |      | BZD (Black) = 138.47 ± 8.31 mm           |                                     |
|                                |      | BZD (Métis) = 134.58 ± 6.84 mm           |                                     |
|                                |      | BZD (Asian) = 140.04 ± 6.59 mm           |                                     |
| Nagham et al. (Iraq)           | 2005 | BZD (M) = 118.96 ± 7.4 mm                | WUCI = BZD/12.34 or WUCI = BZD × 0.08 |
|                                |      | BZD (F) = 108.92 ± 7.92 mm               |                                     |
| Hasanreisoglu et al. (Turkey)  | 2005 | WUCI (F) = BZD/16                        |                                     |
| Bamba et al. (Ivory rating)    | 2006 | BZD = 129.182 ± 6.82 mm                 |                                     |
| Umar et al. (Nigeria)          | 2006 | BZD = 122.496 ± 1.165 mm                |                                     |
| Fortes d’Oliveira (Brazil)     | 2012 | BZD (M) = 110.88 ± 7.06 mm              |                                     |
|                                |      | BZD (F) = 103.29 ± 5.99 mm              |                                     |
| Schuchita et al.               | 2012 | BZD (M) = 114.36 ± 6.95 mm              |                                     |
|                                |      | BZD (F) = 110.42 ± 4.44 mm              |                                     |
|                                |      | BZD = 112 mm                            |                                     |
| Gueye et al. (Sénégal)         | 2014 | BZD = 137.8 ± 5.72 mm                   | WUCI = BZD/15.13                    |
| Jafari et al. (Iran)           | 2014 | BZD = 129.2 ± 7.36 mm                   |                                     |
| Ankita et al. (India)          | 2015 | BZD (M) = 119.76 ± 0.47 mm              |                                     |
|                                |      | BZD (F) = 118.43 ± 0.46 mm              |                                     |
| Sameen et al. (Pakistan)       | 2015 | BZD = 103.31 ± 7.62 mm                  | WUCI = BZD/12                       |
| Bedoya et al. (Colombia)       | 2015 | BZD (metis) = 113.3 ± 6.4 mm            |                                     |
|                                |      | BZD(Afro-Colombian) = 108.9 ± 8.8 mm    |                                     |
|                                |      | BZD (ticuna) = 132.4 ± 4.5 mm           |                                     |
|                                |      | BZD (Malaysian) = 135.16 ± 6.48 mm      |                                     |
|                                |      | BZD (M) = 111.2 ± 10.32 mm              |                                     |
|                                |      | BZD (F) = 131.5 ± 8.8 mm                |                                     |
| Khin et al. (Malaysia)         | 2015 | BZD(Chinese) = 131.72 ± 8.96 mm         |                                     |
|                                |      | BZD (Malaysian) = 135.16 ± 6.48 mm      |                                     |
|                                |      | BZD (Chinese) = 131.72 ± 8.96 mm        |                                     |
|                                |      | BDZ (M) = 136.15 ± 7.33 mm              |                                     |
|                                |      | BDZ (F) = 131.18 ± 7.83 mm              |                                     |
| Palathtungal et al. (India)    | 2015 | BZD (M) = 125.4 mm                      | DICS = BZD/16                       |
|                                |      | BZD (F) = 124.2 mm                      |                                     |
| Mohammed et al. (Saudi Arabia) | 2017 | BZD = 120.2 ± 13.96 mm                  | WUCI = BZD/16                       |
| Shakir et al. (Pakistan)       | 2017 | BZD (M) = 112.04 mm                     | WUCI = BZD/13                       |
|                                |      | BZD (F) = 109.45 mm                     |                                     |
|                                |      | BZD = 111.307 ± 2.870 mm                |                                     |
facilitate the measurement of the UCI point of contact. BZD, IWD, ID, ICD, and ICOD are used as first-line frontal parameters; where a total toothless patient has no pre-extraction documents in the dental hospital environment [17] [18] [19] [20]. However, many authors advocate the combination of these facial parameters in determining the choice of width of the anterior teeth [19] [20] [21]. The average BZD is variable according to gender [22] [23] [8], race [24] and ethnicity [25] [26]. The bizygomatic width among Europeans appears to be smaller compared to that of Africans and Asians. The formula between BZD and WUCI is always obtained in proportion form. This ratio is equal to $1/16$ in several Asian and European countries [11] [27] [28]. However, this proportion is less than $1/16$ in Africa [1] [29]; but also more than $1/16$ in some countries.

5. Conclusion

Demographic, craniofacial and dental determinants of toothed subjects can lead
to a reliable, applicable mathematical formulation to predict the exact width of the upper central incisor. No standard mathematical formulation between BZD and WUCI has been listed in the literature.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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