

**AESTHETICALLY IDEAL BREAST PREFERENCE AMONG PLASTIC
SURGEONS AND GENERAL POPULATION**

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PREFACE

Describing and accurately evaluating the ideal female breast morphology and aesthetic proportions are essential for surgical planning and to establish the goals of surgery as well as to assess surgical outcomes. There are, nevertheless, no measurable aesthetic standards for the female breast, certainly due to its deformability from posture, arm position, and clothing (Brody, 2004).

As a symbol of fertility, female breasts are one of the most significant features defining attractiveness. Additionally, an “aesthetically ideal breast” that every single plastic surgeon seeks to attain is more vital in determining attractiveness than mere hourglass physique proportions. Even though the large impression of attractiveness and ideal proportions greatly depends upon the individual’s aesthetic judgment, artists have attempted since antiquity to develop anthropometric principles and methods for measuring, and defining the beauty of the human physique (Atiye and Chahine, 2018). Henceforth, setting objectively measurable ends is a critically vital element of breast surgical procedures in plastic surgery. Patient satisfaction with her surgical result should be the pertinent criterion and highest priority, and not what the surgeon considers as natural, normal, and ideal either in size and form (Liu and Thomson, 2011).

In this study, we are determining the preference of an ideal breast by using 4 important parameters of assessment which are areola size, upper pole contour, upper pole to lower pole ratio, and breast size.

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ABBREVIATIONS

BMI	Body Mass Index
GP	General Population
HUSM	Hospital Universiti Sains Malaysia
LBR	Leg to Body Ratio
IMF	Inframammary Fold
MMC	Malaysian Medical Council
NAC	Nipple-Areola Complex
NSR	National Specialist Register
PS	Plastic Surgeon
SD	Standard Deviation
UP:LP	Upper Pole to Lower Pole

ABSTRAK (BAHASA MALAYSIA)

Pengenalan :

Menilai secara tepat dan menghuraikan ciri-ciri payudara wanita yang sempurna adalah amat penting untuk membuat perancangan, menentukan arah tuju dan menilai hasil sesuatu pembedahan yang melibatkan perubahan penampilan payudara. Sehingga saat ini, tiada satu piawai yang boleh mengukur kesempurnaan dalam menilai estetik payudara wanita. Oleh itu, penentuan kaedah pengukuran yang objektif merupakan satu elemen penting dalam bidang pembedahan plastik payudara, lebih-lebih lagi apabila, kajian-kajian yang lepas menunjukkan perbezaan pendapat di antara pakar-pakar bedah plastik dan pesakit-pesakit mereka. Dalam kajian ini, penulis ingin menentukan apakah pilihan utama dalam menilai payudara wanita yang sempurna secara estetik dengan menggunakan 4 parameter utama iaitu ukuran saiz areola, bentuk kontur kutub atas, kadar nisbah kutub atas kepada kutub bawah, dan ukuran saiz payudara, dari perspektif pakar-pakar bedah plastik dan penduduk umum di Malaysia.

Metodologi :

Satu kajian keratan rentas dengan menggunakan soal selidik secara interaktif melalui laman web telah dilakukan kepada kumpulan pakar bedah plastik dan kumpulan penduduk umum. Soal selidik ini mengandungi gambar payudara wanita yang direka cipta dengan menggunakan 4 parameter penting untuk menilai pilihan utama tentang penampilan payudara wanita yang sempurna dari aspek estetik.

Keputusan :

Seramai 45 pakar bedah plastik dan 135 lelaki dan wanita dalam kalangan penduduk umum turut serta dalam kajian ini. Tiada perbezaan pilihan yang ketara apabila dibandingkan di antara kumpulan pakar bedah plastik dan kumpulan penduduk umum. Kajian ini secara keseluruhan menyatakan bahawa kedua-dua kumpulan pakar bedah plastik dan penduduk

umum lebih memilih penampilan payudara estetik yang; saiz areola berukuran 3 cm (50.4%), bentuk kutub atas payudara yang sedikit cembung (40.7%), kadar nisbah kutub atas kepada kutub bawah sebanyak 45:55 (36.7%), dan saiz payudara “D cup” (49.25%).

Kesimpulan :

Penampilan payudara wanita yang sempurna secara estetik haruslah mempunyai ukuran saiz areola 3 cm, bentuk kutub atas payudara yang sedikit cembung, kadar nisbah kutub atas kepada kutub di 45:55, dan saiz payudara “D cup”. Sebarang pelencongan dari ciri-ciri ini adalah lebih menjurus kepada payudara yang tidak berketerampilan menarik.

ABSTRACT (ENGLISH)

Introduction:

Describing and accurately evaluating the ideal female breast is essential for surgical planning and to establish the goals of surgery as well as to assess surgical outcomes. There are, nevertheless, no measurable aesthetic standards for the female breast. Henceforth, setting objectively measurable ends is a critically vital element of breast surgical procedures in plastic surgery, moreover, that previous study showed that there were different opinions among plastic surgeons and their patients. In this study, we are determining the preference of an ideal breast by using 4 key parameters of which are areola size, upper pole contour, upper pole to lower pole ratio and breast size from plastic surgeons, and general population point of view in Malaysia.

Methodology:

A cross-sectional study using a web-based interactive questionnaire was conducted among plastic surgeons and the general population group. This questionnaire consists of created images of female breasts with 4 key parameters to assess subjects' preference towards the appearance of an aesthetically ideal female breast.

Results:

There were 45 plastic surgeons and 135 men and women participated in the study. There is no significant difference in the preference when comparing both the plastic surgeons and the general population group. This study showed that generally, both plastic surgeon and general population group more prefer an aesthetically ideal breast that are; areola size of 3 cm (50.4%), slightly convex upper pole contour (40.7%), 45:55 ratio of the upper pole to lower pole (36.7%), and breast size of a D cup (49.25%).

Conclusion:

The appearance of an aesthetically ideal female breast should have areola with 3 cm diameter, a slightly convex in upper pole contour, have a proportion of upper pole to lower pole of 45:55, and with a breast size of a D cup. Any deviation from these parameters is prone to an unattractive appearance.

1.0 Introduction and literature review

1.1 Research background

Describing and accurately evaluating the ideal female breast morphology and aesthetic proportions are essential for surgical planning and to establish the goals of surgery as well as to assess surgical outcomes. Even with the fact that much has been written about aesthetic and reconstructive breast surgery, there is still no actual consensus about what the characteristics are of an ideal female breast (Atiye and Chahine, 2018). As we know, the face has been comprehensively measured and studied, and there are mutual basic dimensional associations between features that have been considered attractive through time, cultures, race, and ethnicity. There are, nevertheless, no measurable aesthetic standards for the female breast, certainly due to its deformability from posture, arm position, and clothing. The female breast is also the most changeable organ in the body, changing with puberty, weight gain and loss, hormonal balance, gestation, lactation, menopause, and just by natural aging (Brody, 2004).

The classic hourglass 90-60-90 form has been generally accepted as the most attractive female figure. As a symbol of fertility, female breasts are one of the most significant features defining attractiveness. Additionally, an “aesthetically ideal breast” that every single plastic surgeon seeks to attain is more vital in determining attractiveness than mere hourglass physique proportions. The individual’s shoulders, spine, ribs, and sternum, as well as the angle and contour of the chest wall, critically affect breast form and its perception. The location of the nipple, breast base, sternal notch, mid-clavicle, inframammary fold (IMF), sternum, upper chest width, middle chest width, lower chest width, anterior axillary line, sternal notch–nipple length, clavicle–nipple length, upper arm length, and nipple–IMF length have all been suggested as key parameters to measure breast ideal aesthetic proportions. Vague parameters such as proportionality, harmony, projection, shape, position, upper pole contour, and lower

pole convexity are important in defining the aesthetic striking and pleasing breast form (Atiye and Chahine, 2018).

Even though the large impression of attractiveness and ideal proportions greatly depends upon the individual's aesthetic judgment, artists have attempted since antiquity to develop anthropometric principles and methods for measuring, and defining the beauty of the human physique (Atiye and Chahine, 2018). Henceforth, setting objectively measurable ends is a critically vital element of breast surgical procedures in plastic surgery. Patient satisfaction with her surgical result should be the pertinent criterion and highest priority, and not what the surgeon considers as natural, normal, and ideal either in size and form (Liu and Thomson, 2011).

1.2 Aesthetic anatomy of the female breast

There is no universal acceptance of what constitutes the ideal breast shape except to say that it should be “attractive” (Hamdi, 2018). The parts of the breast recognized by the naked eye are symmetry, shape and contour, nipple and areola color, size, and shape. The breast shape is anatomically made up of three types of tissue: glandular, fibrous (including suspensory ligaments), and adipose. All these properties greatly contribute to the appearance of the breast in which they reflect on the relative proportion of glandular, fibrous, and adipose tissue that changes with age, menstrual cycle, pregnancy, and nutritional situation (Mugea and Shiffman, 2015).

The ideal shape of the breast can be based on its footprint as a foundation and the thorax. The breast has three dimensions and the footprint or base of the breast that sits on the chest wall makes up the first two dimensions. The shape of the breast that sits on the footprint or the volume that projects from the thoracic wall comprise the third dimension (Hall-Findlay and

Evans, 2010; Hamdi, 2018). The breast footprint is quite variable from patient to patient. An important principle is that the borders of the footprint can be changed by either adding or removing volume. The upper breast border, the IMF, and the medial and lateral breast border define the breast footprint. These borders determine the base but are individually positioned on the thorax. Some breasts, for example, have a wider distance from the sternum than others. In addition, the position of the IMF is variable, leading to inter-individual differences in horizontal and vertical dimensions (Hamdi, 2018; Fansa and Heitmann, 2019).

The upper breast border is always below the level of the pre-axillary crease. The upper breast border is on average 12–14 cm below the clavicle at the midclavicular level. It can range from 8 to 16 cm on an average height patient. The lower breast border is the inframammary fold. This usually lies about 5–10 cm above the lower border of the ribs. The medial breast border is shaped by the skin fascial attachments over the sternum. The skin is held quite firmly down to the bone with a thin intervening subcutaneous tissue layer. An ideal lateral breast border sits close to the anterior axillary line (Hamdi, 2018). The breasts lie on a substantial layer of fascia overlying the pectoralis major muscle superomedially, the serratus anterior muscle in the lower third, and the anterior rectus sheath in the lower medial area (Hall-Findlay and Evans, 2010). When a woman lies on her side, the higher breast folds over the sternum and the lower breast slides downward to the lateral side of the chest. When she stands on her head, the breasts slide toward her chin. When she stands normally, the breast folds over the inframammary crease. The upper and lateral breast borders are relatively mobile, whereas the medial and lower breast borders are relatively fixed (Hamdi, 2018).

Projection as the third dimension is measured as a distance from the thoracic wall to the nipple-areola complex (NAC). Ideally, the shape is conical that is determined by the position of the breast on the thorax and the NAC in relation to breast volume. The NAC is

located centrally on the breast, and the breast does not drop under the IMF (Fansa and Heitmann, 2019).

The precise position of the nipple-areola complex varies widely with the fat content of the breast and the age of the patient. In the nulliparous breast, the nipple position lies approximately 19–21 cm from the sternal notch (Hall-Findlay and Evans, 2010). Additionally, patients prefer convexity and a breast shape that is fuller on the top than on the bottom. The nipple should be located at the level of maximum breast projection. Areola diameters <5 cm are preferred. A semi-circular lower pole contour is ideal. Lower pole ratios (lower pole width/lower pole length) greater than 2 appear boxy. The three-dimensional shape of the ideal lower pole is a sphere that is flattened in the anteroposterior dimension, called an oblate spheroid, which is also the shape of a round (non-form-stable) saline or silicone gel breast implant (Swanson, 2017). Some studies describe the ideal volume distribution by 45% in the upper pole and 55% in the lower pole resulting in a lightly caudal sagging conus. However, the “ideal” shape depends on cultural and social influences (Fansa and Heitmann, 2019).

1.3 Methods on assessing breast aesthetics

Although the judgment of an individual’s perception towards aesthetic value is greatly influenced by constant observations and how an individual relates to beauty and flawlessness, it remains unknown to what amount it is influenced by age, sex, race, and cultural background. Although objective and validated measurements are worthwhile, aesthetics are not only defined simply by metrics alone. There is a great psychological element to patient satisfaction as it associates with the body image. Cosmetic proportion, balance, and harmony with the personal expectations of the individual experiencing the procedure and the surgeon performing it are important aspects that must be looked into when determining satisfaction or benefit (Broer *et*

al., 2015). Despite all of these, it is agreed that beauty is a universal phenomenon that has a universal standard present throughout all civilizations and centuries, and that observed beauty is enhanced and optimal aesthetics are accomplished when accurate measurements are made and proportions, as well as attractive harmonious ratios, are appreciated (Atiye and Chahine, 2018). In discussing ideal breast shape, patient satisfaction should be the relevant criterion, not the natural breast shape. The normal breast may contain greater volume in the lower pole than the upper pole, and the lateral profile of the upper pole may be linear or slightly concave, but normality is not the objective. Patients prefer convexity and a breast shape that is fuller on the top than on the bottom, a finding that is hardly surprising in view of the purpose of bras (Swanson, 2017). There are 2 ways in evaluating breast attractiveness base on literature findings.

1.3.1 Anthropometric measurement method

The first method is by the anthropometric study of a population with an ideal breast while the second method is by seeking preference of ideal breast from a population perception. In the first method, the investigator defines what the supposed criteria for ideal breast are and then select a sample of subjects in which fulfill the said criteria and subsequently measure important anatomical landmark. From the findings, a set of “ideal” measurement metrics are established and are believed to be the standard guideline for a “supposed” ideal female breast. While this method can hardly measure something abstract and vague like shape, harmony, and proportion, it is also having an element of bias as the qualities of that beauty are from the investigator’s perspective.

There were many pieces of research done in accordance with this first method. Among others that are worth mentioning historically such as in 1955 when Penn studied the breast

landmarks on 20 female models aged 18 to 39 years according to his ideal breast concept. The “Penn triangle” which defined an equilateral triangle based on nipple distance from the suprasternal notch does not, however, define shape or form, or any other vital vague components that responsible for the attractiveness of the breasts. Truthfully, it is possible to have the Penn triangle but still have an unattractive breast (Mallucci and Branford, 2015). In 1997, Westreich studied 50 women with ideal breasts where his choices of criteria were defined as breast without ptosis and with no surgical indication. In 1999, Brown et al studied 60 women and stressed the criterion of the regular breast instead of the ideal breast and in 2002, Vandeput and Nelissen took anthropometric measurements on 973 women with near-ideal breast characteristics (Avsar *et al.*, 2010).

All literature mentioned has no definitive and real objective measurement on what constitutes an ideal breast as their findings varied greatly with each other and solely based on their individual’s perspective choice of beauty. One example is in regard to the areola size which is one of the important parameters in determining aesthetically ideal breast. The ideal areola size reported mean areolar diameter is variable. It is 33.2 mm in Asian women, 50 mm for the right breast and 49 mm for the left in Caucasian women, and 36 ± 9 mm for both right and left breasts in Turkey (Avsar *et al.*, 2010). While in the Malay population, its mean of areola diameter was 33.8 mm at the left breast and 33.7 mm at the right breast (Selvaprahasam, 2014). For the reason that the female breast is the most changeable and deformable organ in the body changing shape and relative position with posture, precise reproducible measurements of its morphology are very challenging; consequently, breast surgery has long been regarded as an art more than a science (Atiye and Chahine, 2018). Besides, smaller and larger breasted females exhibit variances in anthropometry, with body mass and BMI representing great associations to breast volume (Brown *et al.*, 2012). Larger BMI has larger torso width which in direct proportion with the body height (include torso length) and in turn proportionate to

breast size (Vandeput and Nelissen, 2002). BMI also greatly influences Waist to Hip Ratio largely on the fat distribution (Prantl and Gru, 2011) which majorly affects the whole body attractiveness particularly the hourglass appearance.

Obviously, this method has numerous pragmatic limitations. Important parameters such as breast projection are hard to measure due to the curvature of the chest wall and mobility of subcutaneous tissue. Additionally, studies of linear measurements must be done prospectively and require further intervention, which is likely to keep the number of subjects small. It is also not feasible to make a large number of measurements on each subject. If a certain measurement doesn't demonstrate valuable, one can't retrospectively try a different one. To attest the validity of a definite measurement, studies across multiple institutions with multiple observers are necessary, which are exorbitant in cost. Henceforth, anthropometry study is currently not routinely conducted since it is impractical to perform (Kim *et al.*, 2008). Furthermore, as stated above this method is bias to the selection criteria of the investigator and can be only be done in young, female, disease-free, non-operated breast subjects in order to measure the breast anthropometrically.

1.3.2 Controlled perception-preference method

In the second method, the investigators inquire about an opinion from subjects to select independently on a range of predetermined parameters of supposedly ideal breast pictures. This method is a reverse approach of the former. Here the study is looking at more abstract and vague parameters like the shape, harmony, and proportions which what habitually perceived from a naked eye. From this, a conclusion is deduced from the parameter sets as to what the ideal breast should look like. This method can surely be applied to ranges of subjects' variants that are not limited to certain "ideal" population as we believed other "non-ideals" are also

entitled to their opinion, therefore the complete beauty perception can be truly and fairly measured. The previous study had found several key parameters that have been identified for an ideal breast such as upper pole to lower pole ratio (UP:LP ratio) and upper pole contour. Any aberration from this configuration is said to produce a less attractive form (Mallucci and Branford, 2012). They later proposed that the main criteria for an ideal breast are 1) UP:LP ratio of 45:55 respectively, 2) Twenty-degree upward-pointing nipple, 3) Straight or slightly concave upper pole contour and 4) Tight lower pole fullness (Mallucci and Branford, 2015).

In regard to ideal physique proportion, one article studied on the leg to body ratio (LBR) towards female physical attractiveness as a whole which showed that low LBR (short leg and long torso) were rated less attractive than the mid-LBR and high LBR (long legs and short torso) (Frederick *et al.*, 2010). This study didn't associate breast attractiveness with that ratio. In other words, whether in low, mid or high LBR the anatomical landmarks proportion in the torso is fixed and doesn't affect the breast size/shape. Likewise, an article study on the body weight, hip-width, waist width, bust size, and leg length as separate parameters to assess female beauty as the overall value but not specifically related to the ideal breast size or shape (Prantl and Gru, 2011). Other important parameters that contribute to the ideal breast appearance include areola size, areola pigmentation and breast size (Broer *et al.*, 2015; Dixon, Duncan and Dixon, 2015). These important parameters are key eye visuals to determine the attractiveness of an obvious picture of a topless female.

In summary, to properly determine aesthetically ideal breast appearance, the second method have more accuracy and reliability as not only it can measure harmonization, proportion, abstract shape, and vague figure, but also can fairly cover and reach vast numbers of subjects including young & old, male & female, single or married, those with breast disease & surgically operated, and obese & underweight individuals. Because all of them entitled to their opinion in regard to the subject matter. From this study, all data can be further dissected

to sub-group in relation to their socio-demographic background. Among these key parameters had been studied and published are areola size (Broer *et al.*, 2015), upper pole contour (Hsia and Thomson, 2003; Liu and Thomson, 2011; Mallucci and Branford, 2012; Broer *et al.*, 2015), upper pole to lower pole ratio (Mallucci and Branford, 2015) and breast size (Dixson *et al.*, 2011; Prantl and Gru, 2011; Zelazniewicz and Pawlowski, 2011; Swami and Tovée, 2013; Dixson, Duncan and Dixson, 2015; Groyecka *et al.*, 2017).

1.4 Aesthetics on areola size

An areolar diameter of 3.5 to 4.5 cm is considered attractive and areolar diameters <5 cm are preferred by patients (Swanson, 2017). The accepted anthropometric standard areola size in the ideal female breast has been classically set at 38–45 mm (Atiye and Chahine, 2018). In the Malay population, it was 33.8 mm at the left breast and 33.7 mm at the right breast (Selvaprahasam, 2014). Alternatively, the optimal areola size may be measured in proportion to breast size. It is suggested that the ideal areola to breast proportion is 1:3.4 (Hauben *et al.*, 2003). In a previous study in regards to the surgeon's perspective, significant differences concerning the ideal areola size were found across countries, with surgeons in Brazil expressing a preference for the largest areola size of 50 mm while surgeons in Germany and France preferred the smallest size of 15 mm. It was also suggested that older surgeons tend to have a preference for larger areolas (Broer *et al.*, 2015).

1.5 Aesthetics on upper pole contour

The contour of the upper pole of the breast, from the takeoff on the upper chest wall to the point of maximum breast projection, is ideally slightly convex (Swanson, 2017). When one seeks breast augmentation; emphasis has been placed on upper pole fullness as a desirable end goal from plastic surgeons. This past assumption that a full upper pole contour which had most convex characteristic was thought as attractive does not hold true (Mallucci and Branford, 2015). Many surgeons like shape with a lower pole curve that is circular but an upper pole slope that is relatively straight or even slightly concave (Hamdi, 2018). Besides, the urge to fill the upper pole shape seems to be patient-led and yet there seems to be no confirmation that this is a desirable feature in the naked breast. It was suggested that the convexity of the upper pole is the desired look in clothing rather than on the naked breast. Ironically, the desired clothed look often does not parallel to attractiveness in the naked breast. This observation is critical for both patient and surgeon in considering aesthetic ends moreover with the findings of previous studies suggesting that both of them have different aesthetic ideals for the breast (Mallucci and Branford, 2014). Nonetheless, another study showed that artificially augmented breasts (fuller, with convex upper-pole contour) are cross-culturally regarded as more attractive than natural breasts (with concave-to-straight upper pole contours) (Groyecka *et al.*, 2017).

In regards to the plastic surgeon perspective, significant differences in opinion exist across countries. For example, the age of the surgeons is negatively correlated with the perception of ideal upper pole contour which suggests that older surgeons tend to have a preference for a more concavity of upper pole contour (Broer *et al.*, 2015). Contrarily, 1 year earlier, a study proposed that the more mature individuals chose more upper pole fullness (convexity), perhaps as a reflection of their own loss of projection over time (Mallucci and Branford, 2014). This difference in preference of upper pole shape among plastic surgeons and

the general population were also found in other studies done in 2003 and 2011 (Hsia and Thomson, 2003; Liu and Thomson, 2011).

1.6 Aesthetics on the upper pole to lower pole ratio

There are numerous instances from Ancient Greece to date; the 45:55 ratio is considered many as the most attractive feature on breast proportion. The Venus de Milo, long-held as a classical icon of nude beauty, has the key feature. Manet's Olympia, first exhibited in the 1865 Paris Salon, also portrays a woman with this feature showing that the 45:55 ratio is accepted as a beauty standard (Mallucci and Branford, 2015)

In the 2014 study, it was found that an upper pole to lower pole ratio of 45:55 was universally scored highest, in particular, by 87 percent of women in their thirties, 90 percent of men, and 94 percent of plastic surgeons. Whereas the second most selected choice was the 50:50 ratio (Mallucci and Branford, 2014). Likewise, a recent online poll conducted by Rohrich, Chief Editor of the journal Plastic and Reconstructive Surgery in regards to the ratio found that of the 1201 votes cast, the vast majority selected the 45:55 ratio (Mallucci and Branford, 2015).

The UP:LP ratio also directly tells the position of the nipple-areola complex (NAC) in its vertical line. Fantozzi proposed an ideal torso proportion including the NAC position based on the work of 90th artist, Carlo Rochet. He suggested that the torso which measuring from the lower jaw to the inner thigh radix divided into 3 equal sections (chin to nipples, nipples to umbilicus, and umbilicus to inner thigh radix) with a ratio of 1:1:1. Any deviation of this will leads to an unattractive torso that includes the NAC position (Fantozzi, 2013).

1.7 Aesthetics on breast size

Adaptive psychological mechanisms play the main role in how attractiveness is judged. Some theories exist regarding the visual cues, including size, symmetry, shape, areola size, and pigmentation brought by the breasts' morphology to a prospective companion. With the exclusion of a few brief periods in history, most particularly the 15th and 20th centuries when women seem to de-emphasize the look of their breasts, large breast size has been considered the ideal of beauty socially in many cultures. In most works of literature, it has been linked with superior fertility as compared to average female breast sizes (Broer *et al.*, 2015). Therefore, breast size or volume is obviously one of the factors affecting attractiveness. Yet, the chief factor is not an absolute size, but rather a breast shape and body proportions. Only breast size proportionate to the entire body will meet attractiveness characteristics; though, views about the ideal breast size differ considerably (Atiye and Chahine, 2018).

Several methods have been proposed to assess breast volume through the use of medical imaging technology, devices based on geometric measurement, water displacement techniques, and breast casts, however, there is no accepted technique for anthropometric measurement of breast volume due to a lack of clear information regarding the accuracy and comparability of each method (Choppin *et al.*, 2016).

Among previous studies on ideal breast volume are, for example, the mean breast volume for Turkish women was 407.2 ± 263.6 mL (Avsar *et al.*, 2010) while the mean breast volume for Malaysian women was 553.38 ± 368.13 mL for the left breast and 536.59 ± 339.21 mL for the right breast (Selvaprahasam, 2014). Whereas in Australian women, the mean breast volume of the left and right breast was 642 and 643 mL respectively (McGhee and Steele, 2011). While, the mean values of the right and left breast volumes were calculated as 386.0 ± 342.5 mL and 393.3 ± 347.2 mL, respectively in Korean women (Kim, Kim and Kim, 2014). These findings evidently show that evaluating ideal breast size by an anthropometric study

produced a greatly variable range across diverse ethnicity and country. But the question is do their preferred perception of desired breast size is the same as the findings of the anthropometric study?

Additionally, the majority of women (and men) seek natural breast beauty and that the longing for an oversized look appears to have infiltrated practice without challenge over the past years. Furthermore, the adverse consequences of oversizing are well recognized and among the most typical reasons for reoperation (Mallucci and Branford, 2014).

In a study of perceptions, male preferences for female breast size seem to be greatly variable. For example, among the Sudanese Azande, men prefer long pendulous breasts; Alorese men of the Alor Island in Indonesia prefer large breasts, and men of the Kenyan Massai tribes prefer firm, upright breasts (Dixon *et al.*, 2011). Within Western cultures, Polish men with less restricted sociosexuality stated great preferences for larger breasts than men with more restricted sociosexuality (Zelazniewicz & Pawlowski, 2011) and British men who scored highly on sexist attitude scales also prefer large breasts (Dixon, Duncan and Dixon, 2015). In general, 40% of men but only 25% of women preferred a large breast across different cultures and ethnicity mainly Caucasians, Asians and African-Americans (Prantl and Gru, 2011). Most of the study performed on the ideal breasts focuses on size, showing that men from western countries prefer medium or big breasts (Groyecka *et al.*, 2017) while in Malaysia, results showed that men from the low socioeconomic background preferred larger breasts as more attractive than did men from the high socioeconomic context (Swami and Tovée, 2013).

Another characteristic of breasts, remarkably uncommon in evolutionary research, which might indicate youth and parity in female attractiveness, is the level of breast ptosis, generally described as a “droop” or “sagging.” Breast ptosis contributes to breast shape and frequently occurs with aging or after weight loss (Groyecka *et al.*, 2017). It has been proposed that men favor a youthful look in women, as it is related to reproductive potential. Thus, ptotic

breasts might suggest older age, higher parity & lower fertility, and in result could be perceived as less attractive. The inclination for perky, firm breasts appears to be echoed in women's real-life choices about their physiques and may clarify the increasing concern in interfering with the breast shape especially by means of plastic surgery (Groyecka *et al.*, 2017). Despite the fundamental nature of these entire outcomes, breast aesthetics is poorly understood and difficult to quantify. In this context, aesthetics refers to the physical features of the breast that define the subjective evaluation of appearance. This lack of standards makes it difficult to compare outcomes of different surgical techniques. It also raises discordance when a discrepancy exists between the aesthetic preference of the plastic surgeon and the patient (Kim *et al.*, 2008). Therefore, patient satisfaction with her surgical aim should be the pertinent criterion and top priority, and not what the surgeon considers as natural, normal, and ideal in size and form (Liu and Thomson, 2011).

The author considered as normal, a breast that was identified as such by the majority of women of the same age group and physiological status. A normal breast was estimated to have a volume somewhere between 300 ml and 500 ml, depending on the woman's physical build, and to be located sagittally between the 2nd and 7th ribs and transversely between the sternal edge and the anterior axillary line. The "tail" of the breast should extend toward the axilla, and the nipple should project at the height of the 4th intercostal gap. The author considered as aesthetic the breast with a pleasant appearance, with a normal size and fullness, minimal ptosis, a conical to a teardrop shape, and the nipple in the most anterior position, coming from a normal proportion, position, and projection. The aesthetically perfect breast was one for which no common aesthetic procedures would be suggested. It is perfectly fit with a perfect body, in perfect harmony regarding proportion, position, and projection. This is the "top model" situation (Shiffman, 2009).

1.9 Rationale of the study

Patients have long desired an augmentation in breast size because of inadequate development, asymmetry, or loss of volume after pregnancy (Hall-Findlay and Evans, 2010). An aesthetically ideal breast was described as a breast figure for which no aesthetic procedure would be indicated. The problem with this definition is that different surgeons have different concepts of when an aesthetic procedure is needed. To put this into perspective, most European Plastic Surgeons feel that what American Plastic Surgeons consider to be the ideal breast is really too large and they would recommend a breast reduction (Kim *et al.*, 2008). The problem not only presents among them but it also significantly differs between a patient and her surgeon (Hsia and Thomson, 2003). Even this dilemma was extending to the pharmaceutical company that manufactures breast implants based on their limited understanding which always leads to an un-versatile shape as a selection. Although there are times, patient's requests may be unrealistic but to acknowledge the fact that there are differences in their perceptions are utmost important to avoid patient disappointment and to achieve satisfying results which may only be accomplished when the expected outcome is discussed with the patient via objective parameters and measurements of aesthetics and beauty (Atiye and Chahine, 2018).

Often, most patients leave the decision to the surgeon as they know it best. This is entirely not true and misleading which generally would lead to an unsatisfying and displeasing outcome. Furthermore, at least in the author's country, post-mastectomy patients for breast cancer have limited access to breast reconstruction due to low referral rates which, in turn, render them unable to get their desire in attaining an aesthetic or near-ideal breast shape should breast reconstruction is done. This was evident in a local cross-sectional study that explored among general & breast surgeons and patients' perceptions of breast reconstruction in breast cancer care showed low referral frequency and low reconstruction rate due to no prior knowledge or offer (Ishak, Yahya and Halim, 2018).

Therefore, to address this problem, this study is conducted to provide an insight to be able to establish the characteristics of an aesthetic ideal female breast in order to assist plastic surgeons alike and potential patients in deciding their surgical outcome. We look into the general population with various races and attempt to relate deep into their sociodemographic associations. As Malaysia is a multiracial country that constitutes vastly in Malay, Chinese and Indian, it should represent well on the Asian community which mostly comprises largely from similar said races. In other words, the study result can be extrapolated to the Asian major countries; China, India, and clearly the Malay Archipelago.

The outcome of the findings may provide some basic guidelines to plastic surgeons on what the public (male and female) consider of an ideal breast in order to assist them in planning, implant choice, and performing breast reconstruction & augmentation surgery. This is true when both the plastic surgeon and the patient are able to sufficiently and efficiently communicate their preferences regarding the shape and relations of the breast; they will be more positive at attaining satisfying results (Broer *et al.*, 2015). Indirectly it also provides knowledge and awareness regarding differences between plastic surgeons and the general population on ideal breast preference if any. Not to mention that the results from this study can be utilized by the manufacturer to design a breast implant that is reliable and conformable to the patient's need according to various desired parameters.

Moreover, the questionnaire set in this study may be used by surgeons as a quick template and guideline in the consultation room to plan and discuss with a patient on breast augmentation, reduction, or reconstruction. To end, the study also acts as a precursor to expand and encourage more research to be conducted to look into more vital parameters, larger demographic and different communities.

In this study, we are determining the preference of an ideal breast by using 4 important parameters of assessment which are areola size, upper pole contour, upper pole to lower pole ratio, and breast size.

2.0 Objectives of the study

2.1 General objective

To study the preference of aesthetically ideal breast appearance among the plastic surgeons and the general population in Malaysia.

2.2 Specific objective

- 1) To determine the current preference of an aesthetically ideal breast appearance among Plastic Surgeons in Malaysia and its association with their sociodemographic factors (age & gender, ethnic background, marital status, and practice type).
- 2) To determine the current preference of an aesthetically ideal breast appearance among the general population in Malaysia and its association with their sociodemographic factors (age & gender, ethnic background, level of education, occupation, socioeconomic status, and marital status).
- 3) To compare aesthetically ideal breast preference between the plastic surgeons and the general population in Malaysia.

3.0 Materials and methods

3.1 Study design

This is a cross-sectional study using electronic web-based interactive questionnaires for data collection.

3.2 Study area

This study was conducted at:

- 1) Group 1 (PS): Kuala Lumpur and email platform.
- 2) Group 2 (GP): Hospital Universiti Sains Malaysia (HUSM)

3.3 Study population

The participants from group 1 (PS) were recruited from the list of registered plastic surgeons in the National Specialist Register (NSR) website and were contacted personally or by email. The participants from group 2 (GP) were recruited from a public individual who walks into the Outpatient & Specialist Clinic HUSM.

3.4.1 Inclusion criteria

- 1) Group 1: Plastic Surgeons (PS)
 - Malaysian citizen
 - Fully registered with MMC
 - Currently, practice in Malaysia

2) Group 2: General Population (GP)

- Malaysian citizen
- Aged more than 18 years old

3.4.2 Exclusion criteria

Those who are unable to read or mentally challenged or emotionally unstable

3.5 Sample size estimation

Prior data indicate that the proportion of General Population (Group GP) was 0.6 (Prantl and Gru, 2011) and the proportion of Plastic Surgeons (Group PS) was 0.9 (Mallucci and Branford, 2014). For an objective to compare the aesthetically ideal breast preference between Group GP and Group PS, we need **45 samples for PS group and 135 samples for GP Group** to detect the difference of 30% (61% versus 94%) with $m=3$, 90% certainty (power) and alpha 0.01, using a two-sided chi-square statistic. The sample size was calculated using PS Power & Sample Size Calculator, Dupont and Plummer, 2009.

3.6 Measuring instruments

3.6.1 Software development

This study uses an electronic interactive questionnaire on the website. This type of study is best to conduct on-screen as the created morphed images/drawing is beautifully and adequately displayed on a high-resolution electronic screen. By using an electronic device such as desktop or tablet, the user experience in interacting with the questions are great, easy, and friendly to use. As opposed to the traditional use of printed paper containing image questions,

the image quality is unreliably not presentable as it should be. There will be a risk of stain, wrinkling and tear to the paper. Not to mention the inability to enlarge the image prompting investigator to print the images in high-quality paper and in a larger size, therefore increase the printing cost. It is also not convenient for the participant as they have to flip papers to compare the images and the need to read it under a good light. Meanwhile, the use of electronic displays permits participants to zoom in & out images without altering the resolution and be able to change the image by clicking onto the buttons without the need to flip the pages. Moreover, the use of internet networking associated with the database storage makes the study convenience, highly reliable, highly mobile, high reach & response rate and easily reproducible.

In conducting this study, a website prototype was developed before it can be used offline or online. This required user interface designs and wireframe which were done personally by the Principle Investigator. We used Adobe Photoshop software to create the graphic user interfaces, flow designs, and prototype before coding them into a responsive website and upload it to a cloud server. All the costing in regards to the software development and hosting server is bound by the Principle Investigator. The webpage (software) was designed containing 10 to 15 pages depending on which group will the participants answered. It has two arms flow (Group PS and Group GP) including Study Information page and Terms & Conditions page which available in bilanguage (English and Malay). We used a simple customized design that is user-friendly and convenient. Although it has server hosting, the conduction of the questionnaire by the participants can be done offline on site. This means, without the internet connection, an iPad/tablet containing the website questionnaire can be conducted by the participants and once the questions are answered, it will then be automatically stored in the backend data.

3.6.2 Breast image development

The development of the graphical breast image is done manually. Each group of participants has 1 set of questionnaire and each set of the questionnaire have 2 sections which are A: Sociodemographic data and B: breast image/drawing questions. This breast image/drawing questions in section B of the questionnaire are created and drawn from scratch by Photoshop Studio CS4 with tools used included Warp, Twirl, Pucker, Bloat, Blend and Push to achieve the different desired qualities. There are 21 drawings of images created. These images are not real photographs of real female breast and the final product of a portrait drawing are converted in black and white to eliminate possible biases resulting from differences in skin tone and image quality (Hsia and Thomson, 2003).

To make the morphed drawing of the breast, a standard drawing must be created first as a fixed guideline for modification. This standard drawing is drawn according to several important anatomic landmarks based on anthropometric studies of the ideal breast with some adjustment to match with the current study requirement. Hence, a scale according to Penn's ideal is used for a standard drawing with a few alterations based on the measurement obtained from the local anthropometric study (Selvaprahasam, 2014). The NAC position is drawn in such a way, where it should be in the middle of the vertical y-axis and slightly lateral to the meridian of the horizontal x-axis (ratio of 40:60x; 50:50y) (Lewin *et al.*, 2016). This NAC position also follows the ideal torso proportion by Carlo Rochet which situated at 50:50 vertically (Fantozzi, 2013). No drawings include any form of true ptosis. To exclude any potential influence of waist circumference on attractiveness rating (Hip-Waist ratio), the upper torso was shown from the neckline to just below the lower rib. This also helped to avoid exaggeration effects, where graphically enlarged breasts look unnatural and disproportionate on the unchanged female figure (Zelazniewicz and Pawlowski, 2011). All the drawing images are drawn according to standard medical photography and have no element of pornography.

Each development of the drawing panel for each parameter is further explained below under their sub sections.

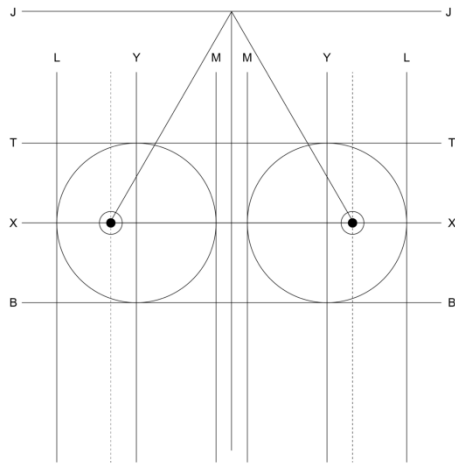


Figure 1: Basic framework as a standard guideline for all drawings.

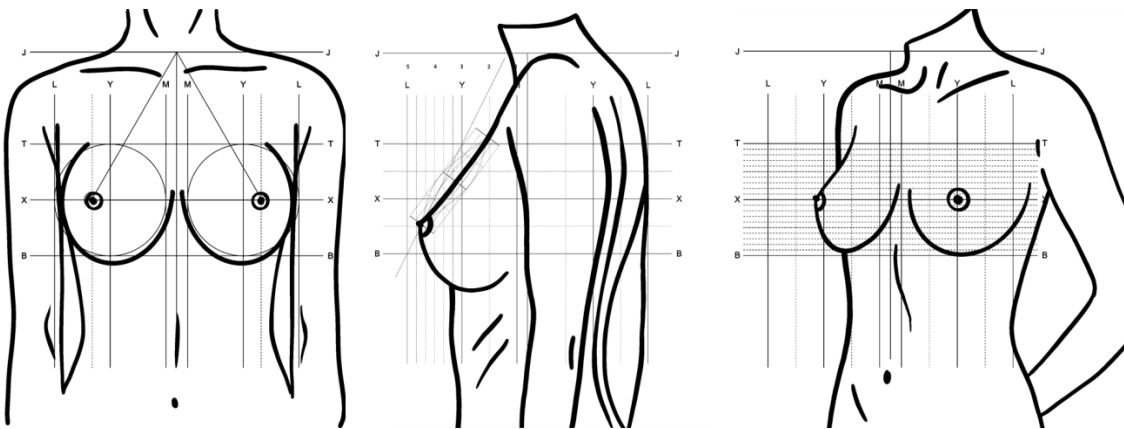


Figure 2: All 3 basic standard drawings were drawn with the basic guideline showing from the left; front view (anterior), side view (lateral), and oblique view as according to the standard medical image.

3.6.3 Questionnaire development

The questionnaire contains 2 sections. The first section of the questionnaire is different for each group participant while the second section of the questionnaire is similar for both groups. Both groups of participants are expected to finish answer the questionnaire in between 5 to 10 minutes.

Section A- Demographic Data (Independent variables)

- 1) Plastic Surgeons group: include information on age, gender, ethnicity, type of practice, and marital status. (5 questions)
- 2) General Population group: include information on age, gender, ethnicity, education level, occupation, economic status, and marital status (7 questions).

Section B- Breast Image Questions (Dependent variables)

This section is alike for each group of participants in which the questions include areola size, upper pole contour shape, the ratio of the upper pole to lower pole, and size of the breast (4 image questions). All breast image questions contained in this section are manually drawn by the Principle Investigator using Adobe Photoshop from empty canvas and are not taken or copied from other sources which concluded that any form of permission of copyright & credits is not required. There is no specific scoring or rating system used in the assessment. However, evaluation is made by looking into the number of participant's selection upon one image in each parameter panels. The participants are asked to select only one image that contains the most attractive look of all in each parameter panels. From this number of selections, proportions/ percentages are derived based on the socio-demographic data collected in section A of the questionnaire.

This assessment questionnaire method is convenient, easily reproducible, and has been used previously (Hsia and Thomson, 2003; Prantl and Gru, 2011; Mallucci and Branford, 2014; Broer *et al.*, 2015). The concept view of the image and the accompanying questions are similar to previously published literature which has been validated and used worldwide. The images of each parameter panels were stacked on top of each other and displayed as one image on the screen page of the questionnaire website. Hence, there will be only 4 pages containing 1 display which comprising of 22 images. There are buttons beside the image for participants to click to change the value (shape) of interest of the breast image. The specific labels of value (e.g. 30mm, 45:65 ratios, 2+ contour or 700mL size) are hidden from participants to prevent bias. All parameter images drawn below are explained further with commentary based on previous works of literature.

3.6.3(a) Areola size

This important feature in the female breast is one of the important characteristics to define the attractiveness of the breast (Broer *et al.*, 2015). The areola images are set to 5 panels which are 15 mm, 20 mm, 30 mm and 45 mm in diameter. The areolae were cropped out of the standard drawing in Adobe Photoshop and size adjustments were made (enlarge and shrink) before the areolae were blended back into the original drawing. Other body landmarks such as the breast size, position of the nipple-areola complex, and the torso shape are remained constant and standard to prevent assessment bias. The areola size can be changed accordingly by participants via the provided button on the screen. The participant then will be asked in the questionnaire to choose one image only which is the most attractive.