SYSTEMATIC REVIEW: EXPLORING THE ASSOCIATION BETWEEN FACIAL CREASE OF ADULT FEMALE BASED ON THE APPLICATION OF COSMETIC SKIN CARE PRODUCT

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by

NUR AFIQAH BINTI ABDUL BAHSIR

Thesis submitted in partial fulfilment of the requirements
for the degree of
Master of Science (Forensic Science)

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CERTIFICATE

This is to certify that the dissertation entitled

"SYSTEMATIC REVIEW: EXPLORING THE ASSOCIATION BETWEEN FACIAL CREASE OF ADULT FEMALE BASED ON THE APPLICATION OF COSMETIC SKIN CARE PRODUCT"

is the bona fide record of research work done by

NUR AFIQAH BINTI ABDUL BASHIR

during the period of February 2020 to September 2020 under my supervision. I have read this dissertation and that is my opinion in it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation to be submitted in partial fulfilment for the degree of Master of Science (Forensic Science).

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.....

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DECLARATION

I hereby declare that this dissertation is the result of my own investigations, except where otherwise stated and duly acknowledge. I also declare that it has not been previously for concurrently submitted as a whole for any other degrees at Universiti Sains Malaysia or other institutions. I grant Universiti Sains Malaysia the right to use the dissertation for teaching, research and promotional purposes.

……..

NUR AFIQAH BINTI ABDUL BASHIR

Date: 9/9/2020

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LIST OF ABBREAVIATIONS AND SYMBOLS

%	Percentage
&	And
<	Less than
=	Equal
AA	L-ascorbic acid
AHA	α-hydroxyl acid
APAC	Asian Pacific
BHA	β-hydroxyl acid
et al	*et alia* – and other
HA	Hyaluronic acid
HD	High definition
HUSM	Hospital Universiti Sains Malaysia
kg	Kilogram
mm	Millimeter
NEA	Northeast Asian
PIH	Post-inflammatory hyperpigmentation
SCA	*Cryptomphalus aspersa* secretion
SEA	Southeast Asian
TEWL	Transepidermal water loss
USM	Universiti Sains Malaysia
UV	Ultraviolet
VPS	Visual perception system
WSEM	Water soluble egg membrane

Ulasan Sistematik: Penerokaan Hubungan Antara Kedutan Muka Wanita Dewasa Berdasarkan Penggunaan Produk Penjagaan Kulit

ABSTRAK

Kajian ini dilakukan untuk menganalisa perubahan kedutan muka di kalangan wanita bergantung kepada penggunaan produk penjagaan kulit. Pembentukan lipatan muka, kedutan atau garis halus boleh kelihatan seawal usia 30-an. Kedutan kulit boleh disebabkan oleh faktor intrinsik and faktor luaran. Namun begitu, evolusi produk anti penuaan yang mengandungi bahan aktif akan dapat membantu melambatkan proses penuaan kulit. Terdapat dua jenis pengumpulan data yang terlibat dalam kajian ini iaitu pengumpulan data primer dan sekunder. Kedua-dua data ini memberikan maklumat yang bererti dalam kajian ini. Walau bagaimanapun, kajian ini memberi tumpuan kepada pengumpulan data sekunder, di mana kaedah yang digunakan untuk data sekunder adalah ulasan sistematik. Oleh itu, satu penelitian maklumat telah dilakukan sehingga Julai 2020 di dalam tiga pangkalan data iaitu *'PubMed', 'Google Scholar'* dan '*Science Direct'* dengan menggunakan kata kunci *'skin aging', 'facial crease', 'facial wrinkle', 'anti-aging cosmetic', 'anti-aging active ingredient',* dan *'aging women'*. Pemilihan artikel dipilih berpandukan kriteria rangkuman dan penolakan jika artikel tersebut tidak berkaitan objektif kajian. Daripada proses penelitian maklumat, sejumlah 2559 tajuk telah dijumpai dan selepas menyingkirkan semua artikel pendua, ketidaksesuaian tajuk dan abstrak, jumlah artikel telah dikurangkan ke 150 tajuk. Artikel berjumlah 150 telah ditapis dan hanya 17 artikel sesuai dengan kajian. Sebagai kesimpulan, kajian ini telah menunjukkan hubungan antara kedutan muka dan bahan aktif dalam produk kecantikan anti penuaan. Produk ini memainkan peranan yang penting dalam melambatkan proses pembentukan kedutan muka atau lipatan.

Systematic Review: Exploring The Association Between Facial Crease Of Adult Female Based On The Application Of Cosmetic Skin Care Product

ABSTRACT

This study is carried out to analyse the changes of facial crease among female based on the usage of skin care product. The formations of facial crease, wrinkle or fine line manifest as early 30 years old. The facial crease changes are caused by intrinsic and extrinsic factor. The evolution of anti-aging skin care product that contains active ingredients will be able to help in delaying of skin aging process. There are two types of data collection involved in this study which is primary and secondary data collection. Both of these data give significant information in this study. However, this study focuses on the secondary data collection where the method used for secondary data was systematic review. A literature search of PubMed, Google Scholar and Science Direct was conducted through July 2020 using keywords including "skin aging", "facial crease", "facial wrinkle", "anti-aging cosmetic", "anti-aging active ingredient", and "aging women". The selection of article was select based on the inclusion criteria and exclude any article does not relate to the objective of the study. From the search method, a total of 2559 titles were found. After removing duplications, irrelevant title and abstract, the number of articles were reduced to 150. Out of the 150 titles, 17 tittles were seen suitable for inclusion in this review. The studies show that the relation between facial crease and anti-aging cosmetic where active ingredient in anti-aging cosmetic generally plays an importance role to delay the formation of crease or wrinkle.

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The development of cosmetic and skin care products has increased markedly in the past few decades (Wilson, 2009). This situation occurred to fulfil people gratification for grooming their self. In the development of the new era, advance technology, better education and economy will provide people with more information to seek a better lifestyle. Hence, peoples who are more concern about hygiene and their appearance have the power to decide what they want to purchase. The power of purchasing skin care product will give some reflection to our skin texture beside age, state of health and lifestyle (Surakiatpinyo & Moungjhem, 2010).

The survey stated by Garre *et al.* (2017) was conducted by American Society for Dermatologic Surgery in 2015 reported that skin texture and discoloration is the most concern among respondents while 67% of them bothered about skin sagging. The revolution of skin aging treatment and cosmetic intervention is one of the alternatives that must be continued to satisfied consumer's needs since the expected anti-aging product demand by consumer is shown in Figure 1.1.1 while the expected sales of anti-aging market is shown in Figure 1.1.2. According to the United Nations (2019), the number aging population in world will increase in doubly by 2050. Hence, the increase of population will increase the demand of skin care product.

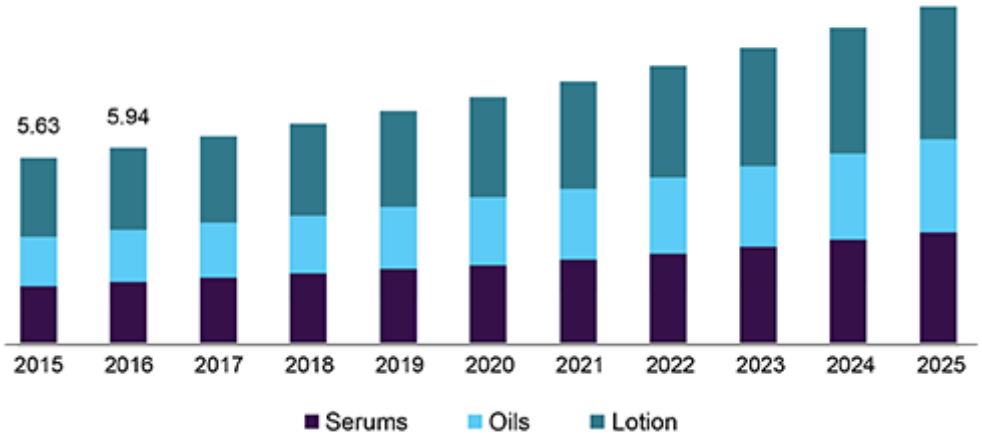

Figure 1.1.1: The expected trend of rising demand among consumers in Asian Pacific (APAC) population (Anti-Aging Market Size, Industry Statistics | 2019 - 2024, 2019)

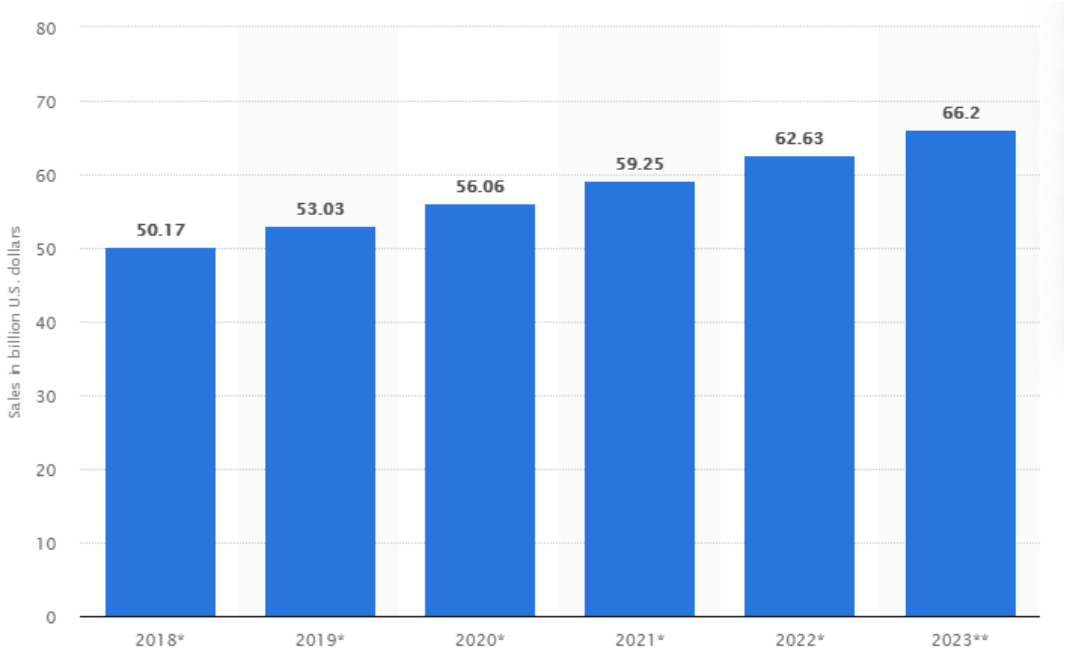

Figure 1.1.2: The expected sales of anti-aging market 2018-2023 (Shahbandeh, 2020)

1.1.1 NATURAL AGING PROCESS

Aging is an irreversible process that occurs in living things with increasing age and cannot be changed and avoid from happening. The definition of aging according to Cevenini *et al.* (2008) is a complex biological process occurred when effected by the combination of two factors which are intrinsic or known as endogenous and extrinsic or known as exogenous. In this context, intrinsic factors are the natural process take place when has internal influences that can changes the skin texture such as hormone, genetics and others while extrinsic factors are the external influences that can accelerate the mechanism of skin aging such as sleeping pattern, stress, smoking, dietary intakes and others (Addor, 2018).

However, aging process is a phenomenon that occurs naturally, and different peoples show different aging process where it depends on the internal and external factors. The study by Ng (2015) showed that the increase of people ages will change the craniofacial shapes and skin texture. In term of anthropometric point of views, human life has two different phases of cycle in form of the changes of aging and face growth (Mark *et al.*, 1980). Figure 1.1.1.1 shows the example of facial aging changes in male face from childhood to adult. From the figure, it clearly showed the phase changes of skin texture and face shape from child to adult where an adult has slightly larger face compared to child.

Figure 1.1.1.1: The example of facial aging changes in male face from childhood to adult (Ng, 2015).

1.1.2 COSMETIC SURGERY

Facial attractiveness is one of the reasons why people have high tendency to do cosmetic surgery. The judgment from society related to a personal appearance most probably because this surgery occurred. Furnham & Levitas (2012) study the factors that influence people to undergo cosmetic surgery in term of self-esteem, life satisfaction, self-rated and physical attractiveness. From the study, individuals who have low self-esteem, low life satisfaction, and low self-rated attractiveness has a greater tendency to undergo cosmetic surgery. The term cosmetic surgery is referring to the procedure and techniques that mainly focus on enhancing facial appearance. There are several examples of cosmetic surgery procedures which are facial contouring, facial rejuvenation and skin rejuvenation. These produces are focusing on the face instead of other areas (American Board of Cosmetic Surgery, 2020).

Besides, the presence of cosmetic surgery industries can solve aging issues in the community. This can be proven when a study of injection dermal filler into the skin layer to increase the volume of facial deficiency by Nobile *et al.* (2014). When a person ages, the amount of hyaluronic acid reduces and skin texture will start to lose its shape. Thus, this study found a hyaluronic acid (HA) injection has improved skin hydration and elasticity, where it significantly reduces the wrinkle depth.

The cosmetic surgery industry is very popular in East Asian countries such as China, Korea and Japan (Gao *et al.*, 2018). Besides, women in these countries mostly have smaller face area and slanted on a study conducted on Chinese Han women (Zhao *et al.*, 2013). From Zhao *et al.* (2013) study, they found those population has smaller bizygomatic and greater temporal width. Thus, the Han women facial types are mostly oval and inverted triangular instead of a trapezoidal face. Other than that, studies by

Farkas *et al.* (1984) and Sforza *et al.* (2009) on Caucasian population found the Caucasian women have a round face and a concave soft tissue profile. In addition, most of them have larger eyes, big mouth and smaller nose.

Although the facial skin and shape among races are not similar, the presence of cosmetic surgery is able to change the shape of face depending on their preference. When a person undergoes cosmetic surgery to alter their face, it will be cumbersome for a forensic scientist to identify the age. Figure 1.1.2.1 shows facial changes before and after surgery.

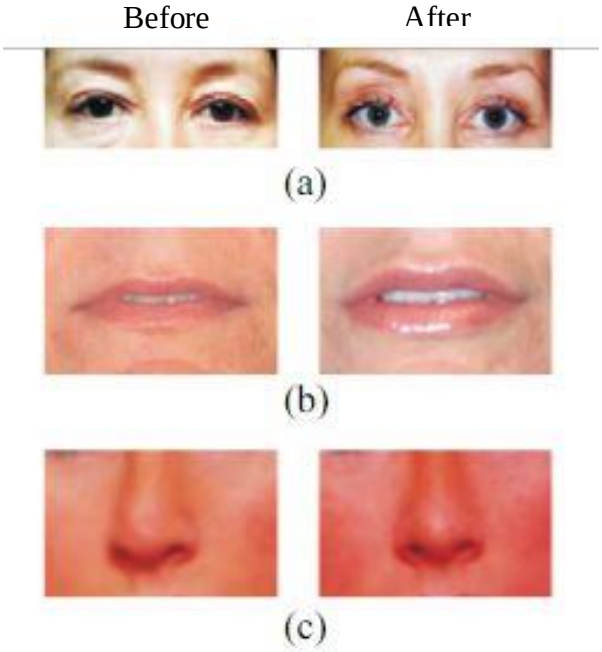

Figure 1.1.2.1: The facial changes before and after surgery (Singh *et al.,* 2010)

1.2 PROBLEM STATEMENT

In this study, facial crease and the benefit of the active ingredient in anti-aging product are the research interest. Facial crease will be able to help forensic scientist to estimate the age of that person. Based on the literature review, there is no data of facial crease among Malaysian women around 40 to 60 years old since women around this age

has a major problem with creases. However, this study also includes women aged 30 years old and above where the prematurely ageing started to begin. Most of the study only compare between European country and African country. However, there are few studies related to this study was conducted on Korean, Japanese and Chinese population.

Despite that, it quite difficult to find published papers related to this research for South East Asian (SEA) region. Based on the literature review, there was no study related to facial crease and active ingredient in anti-aging skin care among women in Malaysian population. Thus, this study will give more information and knowledge regarding the benefit of anti-aging products in the prevention of wrinkles. Meanwhile, this study is also very crucial to give information about the morphology of facial crease among ageing women in Malaysia for the development of a face crease database.

1.3 AIM

The aim of this research is to study the relationship between the application of skin care and the morphology of facial creases among women aged 40 to 60 years old.

1.4 OBJECTIVES

1.4.1 GENERAL OBJECTIVE

The general objective of this study is to study the appearance in facial crease morphology of women around age 40 to 60 years old related to skin care products.

1.4.2 SPECIFIC OBJECTIVES

The specific objectives of this study are:

1. To identify the benefit of active ingredients in anti-aging products.
2. To explore the relationship between the active ingredients in anti-aging cosmetic that helps in the prevention of wrinkles formation.
3. To assess the skin parameters that help to suppress the wrinkles formation.

1.5 SIGNIFICANT OF STUDY

This study is carried out to analyse the changes of facial crease among female based on the usage of skin care product. The effect after using skin care product somehow will help in the prevention of crease or wrinkle formation. The extreme facial crease or wrinkle will change the skull structure and will give a unique character in human identification. According to Hadi & Wilkinson (2018), based on the morphology in a skull-image, it will help to estimate and reconstruct of faces using skull is proven can be very useful in forensic area. It will play an important role in helping the personal identification related to forensic cases and enhancing the accuracy rate of the identification process.

CHAPTER 2

LITERATURE REVIEW

2.1 SKIN ANATOMY

Skin or known as cutis in Latin word made up of multiple layers of tissues and cells is the largest complex structure that covers the entire body has important functions for an organism. It can act as a protective barrier from any harmful of outside surrounding such as ultraviolet radiation and others from entering the internal layer of skin. Other than that, it helps in regulating body temperature, absorption, secretion and blood store. Generally, the thickness of human skin is 2 mm and weight about 4.5 to 5 kg or 17% of adult weight (Tortora & Derrickson, 2016).

Skin is an integumentary system that consists of hairs, sebaceous gland and nerves that work together as a structure. The skin layer consists of three different layers which are epidermis, dermis and subcutaneous fat tissues (Benítez & Montáns, 2017), where the epidermis is the outermost and thinner layer while dermis is the inner and thicker layer. Subcutaneous fat tissue is the fat layer located at the bottom of the skin layer under the dermis. Figure 2.1.1 shows the cross-section of skin structure.

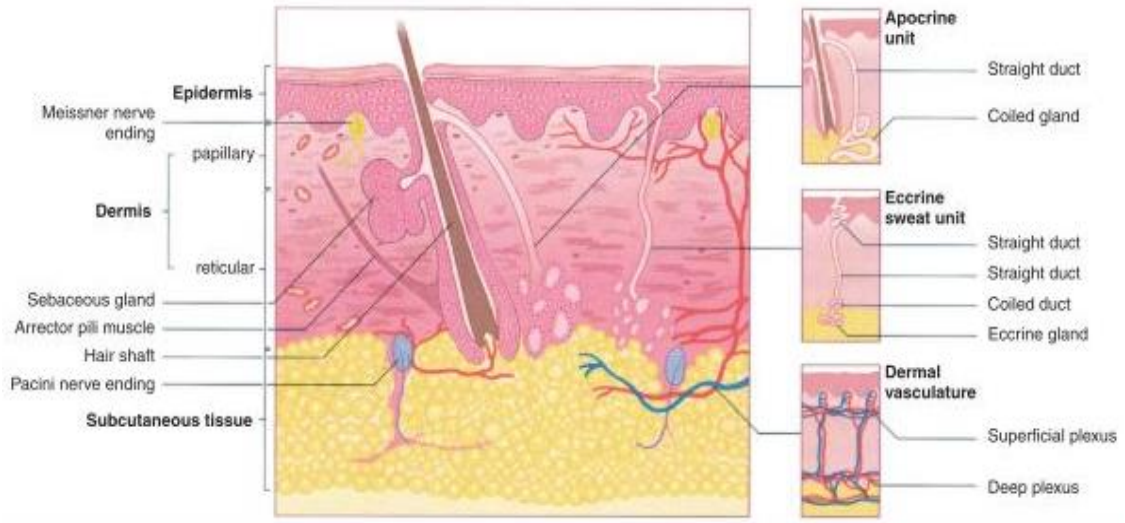

Figure 2.1.1: The cross- sectional of skin structure (Kolarsick *et al.*, 2006).

Epidermis is the outer layer of the skin where it can be seen by naked eyes. It is made up of stratified squamous epithelial tissues that consist of keratinocyte and melanocyte cell. Keratinocyte cells or known as keratin acts as protecting agents where it protects the internal parts from the external stressor. However, melanocyte cells or known as melanin is the pigment that gives skin colour (Tortora & Derrickson, 2016). Thus, the darker the skin colour of a person show a high amount of melanin in their skin.

Dermis is the inner part and the thicker layer compared to the other two layers. It is made up of connective tissue and consists of two different layers of the dermis which are the papillary layer and the reticular layer (Masayuki & Yoshikazu, 2018). Blood capillaries, oil and sweat glands, nerve, and hair follicles are important to skin accessories located in the dermis layer. Fibrous proteins in form of elastic and collagen will provide support to the skin where it will allow the skin to return to the normal texture after applied any stressor on the skin surface (Tortora & Derrickson, 2016).

The bottom layer of the skin structure is subcutaneous tissues. It is a fat layer located under the dermis. The function of subcutaneous tissues is a cushion that absorbs any external shock and it also acts as protecting the body from heat or cold of outside air. However, this layer has different thickness and depending on which part it is located (Kolarsick *et al.*, 2006).

Over a period of time, the skin will undergo changes where it will lose elasticity in terms of decreasing the elastic fibre in the dermis layer. As the result, the skin becomes thinner, sagging and lead to the formation of wrinkle (Farage *et al.*, 2007). Face wrinkle is one of the most visible signs of skin aging. The definition of aging is an irreversible process that commonly occurs with increasing of human aged and often noticed on the skin (Hamer *et al.*, 2017). This is supported by Hadi (2014), where the author mentions that aging is a progressive, irreversible and universal event without external intervention such as cosmetic surgery. However, the author also mentions that the changes in skin are unfavourable to the human. Figure 2.1.2 shows the difference in skin thickness between young and aged skin.

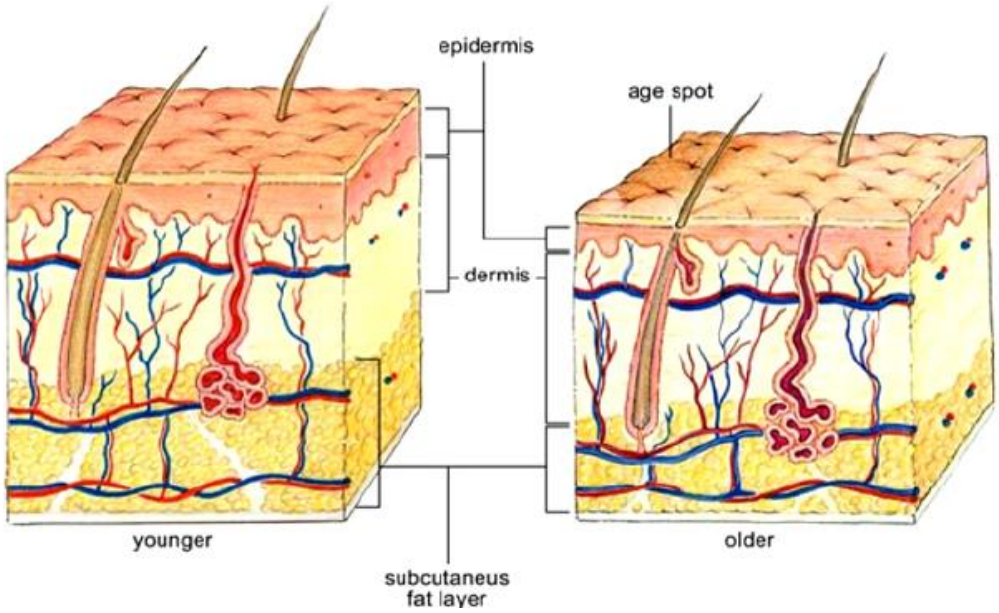

Figure 2.1.2: The different of skin thickness between young and aged skin (Farage *et al.*, 2007).

2.2 CREASE AND WRINKLE

Skin wrinkling is the sign of aging which happen when the number of collagen fibres started to decrease. Crease, wrinkle and fine line are the examples of facial wrinkling. The formation of wrinkles, lines, furrows and folds can be described by the changes of skin texture, elasticity and hydration (Lemperle *et al.*, 2001). Figure 2.2.1 shows the textural changes in the facial skin.

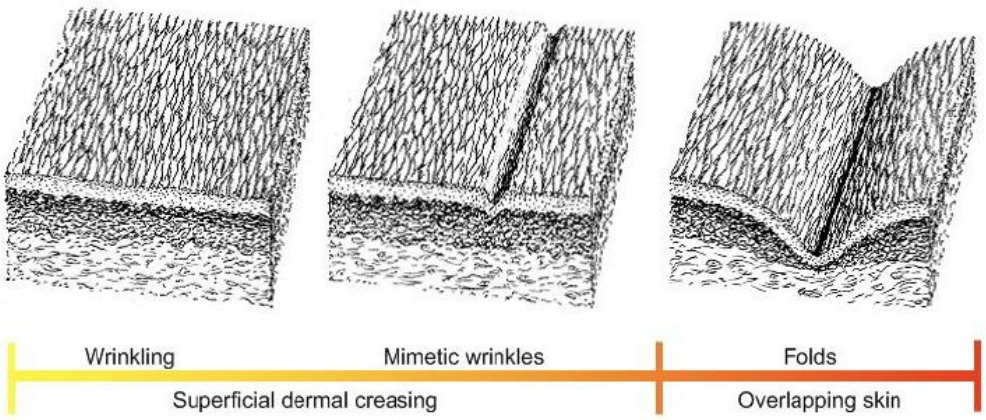

Figure 2.2.1: The textural changes of the facial skin (Hadi, 2014).

Crease can be defined as the formation of wrinkles or furrows on the skin where wrinkles are the depth of the crease and slightly ridge in a smooth surface (Lemperle *et al.*, 2001). Figure 2.2.2 shows the locations of wrinkles and folds on the human face. However, the crease and wrinkle are formed due to the effect of external and internal factors or known as aging mechanism.

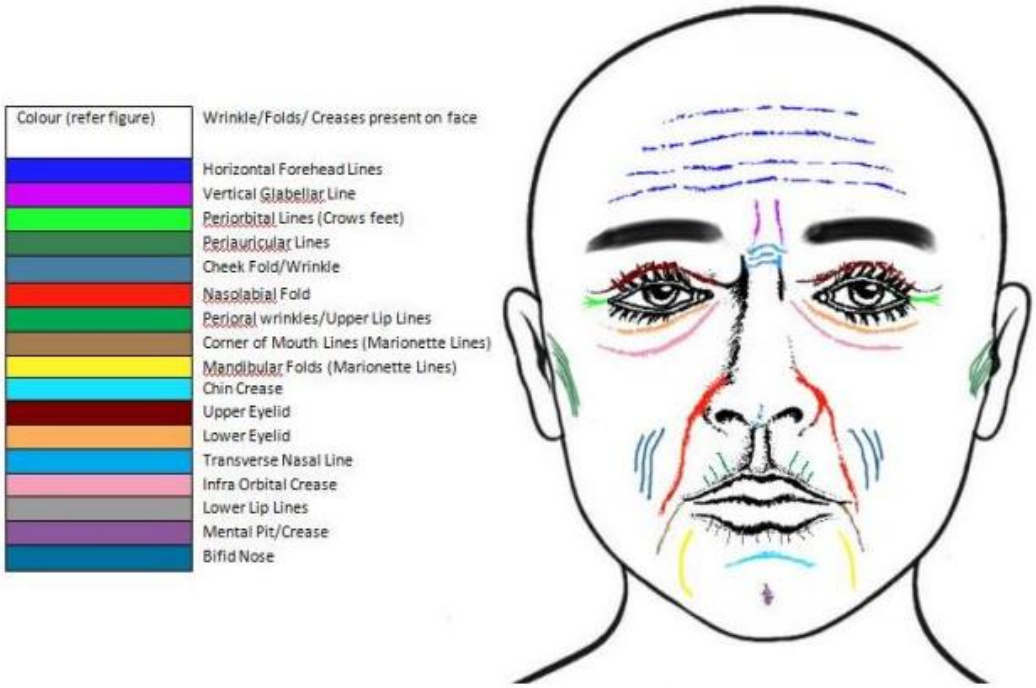

Figure 2.2.2: The location of wrinkles and folds on human face (Hadi & Wilkinson, 2017).

One of the examples of facial crease is nasolabial fold. Nasolabial fold or known as smile line is one of the creases that located on the facial region. Prominence nasolabial fold can easily be seen by naked eyes. It can be an indicator of the early sign of aging (Souphiyeh, 2015). Also Pessa *et al.* (1998) explained about creases morphology but in a different subject which is cadaver dissection. From this research, it was classified the length of nasolabial fold into three categories which are short, extended and continues. Despite that, the studies by Zufferey (1992) and Souphiyeh

(2015) were classified nasolabial fold into three types which are concave, straight and convex in human. Figure 2.2.3 shows the different classification of the nasolabial fold by Souphiyeh (2015). However, this formation is depending on the fat, tissue and muscle thickness in human skin (El-Mesidy *et al.*, 2020).

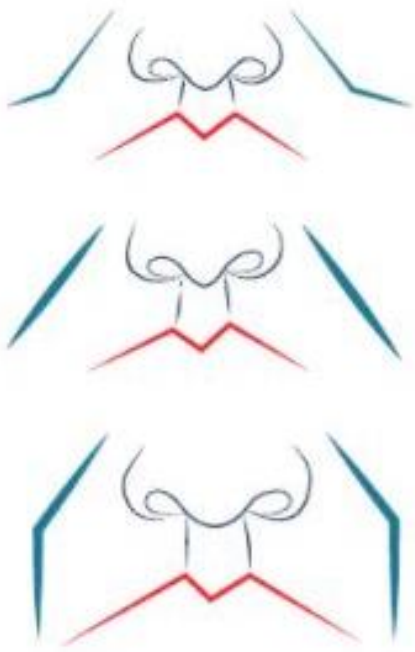

Figure 2.2. 3: The nasolabial folds anatomic variation (Top–bottom: concave, straight, convex) (Souphiyeh, 2015).

2.3 FACTORS OF CREASE FORMATION

Basically, the formation of wrinkle can be influenced by two types of mechanisms which are intrinsic and extrinsic. Intrinsic or known as endogenous is a natural occurrence which occurs due to several factors which are cellular metabolism, genetic, hormone and metabolic process (Ganceviciene *et al.*, 2012). The result of intrinsic occurrences can be in form of fine lines, wrinkles, sagging skin or dry skin.

Meanwhile, an extrinsic or exogenous mechanism is influenced by outside factors such as chronic light, sun exposure, pollution, UV radiation, and toxin (Wilson, 2009).

Hyperpigmentation, dry skin and deep wrinkles are the examples of extrinsic mechanism. However, both mechanisms are occurring simultaneously since the beginning of aging process and cause the formation of crease or wrinkle.

2.4 SKIN CARE PRODUCT

Crease and wrinkle are one of the problems faced by aging peoples. To reduce the formation of crease or wrinkle, the cosmetic industries started to focus on the skin care treatment, dermatological treatments or cosmetic interventions to find a better solution for skin aging problem in over the past two decades (Wilson, 2009). The skin care product can be in form of two types of product which is a medicinal product and anti-aging product (Ganceviciene *et al.*, 2012). However, in this study, we are focusing in anti-aging cosmetic.

2.4.1 ANTIAGING COSMETICS

Healthy and clean skin is one of the needs that human want in their life. Meanwhile, functioning skin barrier will act as a protector against external exposure factors such as microorganisms, radiation, and others. However, the skin function will decrease along with the increase of ages and cause the formation of wrinkles or skin disease due to rapid aging process. The aging process usually started at the age of early 30's. Peoples at this age have a high desire to find a suitable product to suppress the aging process. Despite that, the marketing search by Capitalizing on the Cosmeceutical Market (2007) showed that women over the age of 50 were the highest aged that prepared to use anti-aging product compared to others. Although the survey showed women over the age 50 have the highest concern toward their appearances, Katsigiannis

(2005) stated that women should begin to purchase this product at their early age so that it could help to prevent aging process at the early stage.

Anti-aging cosmetic is a cosmetic contain various active ingredients which have several benefit and function depends on skin suitability that will be able to delay the effect of skin aging process (Bissett & Johnson, 2010). The function of anti-aging cosmetics is to help in reduction of wrinkle, improve skin hydration, skin elasticity and skin sagging. However, anti-aging cosmetic can be divided regarding their effect or function. According to Li (2015), there are three categories of anti-aging cosmetic which are moisturizing, antioxidant and the biological activity of cosmetics. Each type of anti-aging cosmetic has its own function and active ingredients that are able in helping skin aging problem. However, the study by Mohiuddin (2019) showed that to prevent the aging or skin aging occur, scientists need to focus on this three types of cosmetic categories which are ultraviolet (UV) protection, free radical scavengers and cell protecting agents.

Moreover, the study by Surber *et al.* (2015) focus on the skin care in the elderly was classified the skin care product into three types which are cleansing, soothing, restoring, reinforcing and protecting products. Basically, the soothing, restoring and reinforcing products more likely act as a moisturizing product. The most common active ingredient used to hydrate skin is hyaluronic acid (HA). Besides, the most important skin care product is protecting product (Surber *et al.*, 2015). This product will act as a physical barrier which able to protect the skin from external contamination or exposure such as UV radiation.

The evolution of anti-aging cosmetic is to fulfil human needs based on their skin problems (Wilson, 2009). Some consumers were still unable to identify and find it

difficult to select a suitable anti-aging product when the products do not give a good effect. As a result, they will seek help from physicians in the aesthetic area to assist and recommend a suitable product. The recommendation from physicians is usually based on evidence-based effect and potential side effect of the product from the previous research study (Martin & Glaser, 2011). Thus, the different effect of the product will produce the category of anti-aging cosmetic regarding their function and skin type.

2.5 AGING FACIAL CREASE PROPERTIES BASED ON DEMOGRAPHIC INFORMATION

In this context, facial demographic information is regarding a persons age, race, ethnicity, gender, marital status, income, education, and employment. The information could give valuable information according to research interest. This subtopic discusses the benefits of demographic information related to the facial crease.

Naturally, different gender between women and men also can affect the formation of crease and wrinkle. The study by Hamer *et al.* (2017) and Rahrovan *et al.* (2018) explained that different gender showed difference depth of wrinkles form due to hormones, lifestyles, physiological factors, daily skin care habit and educational levels. From both studies, age was the strongest factor of wrinkles formation where young peoples have fewer wrinkles compared to adults. However, the changes of skin elasticity seem to influence women compared to men (Trojahn *et al.*, 2015) because adult females have less collagen compared to adult men (Shuster *et al.*, 1975).

Other than that, ethnicity is one of the factors that affect the formation of wrinkles. Ethnic variation from different population and regions has dissimilarities skin texture where their skin has been adapted to the environment and lifestyles. The study by

Campiche *et al.* (2019) reported that African countries show delayed signs of aging compared to Caucasian countries. Delayed sign of aging was caused by a low level of melanin in the epidermis layer which eventually reduces the visibility of wrinkles.

However, Caucasian women reported moderate to severe wrinkling compared to Asian and Hispanic based on Fitzpatrick's skin type (Mohiuddin, 2019). Asia is a huge region that consists of abundance ethnic and majority of Asian has darker skin. The word Asian usually referred to people from Southeast Asian (SEA) region. This situation is contradicting with Northeast Asian (NEA) peoples (Korean, Japanese, and Mongolian) that have lighter skin tone (Knaggs, 2009).

In addition, the country that received more sunlight and geographically closer to the equator is more prone to darker skin such Southeast Asians region (Knaggs, 2009). The darker and thicker the skin, the visibility of wrinkles will be lowér. This can be supported by Chan *et al.* (2019) study that Asian and African has a thicker skin, less pigmentation and more compact skin compared to Caucasians and white skin people.

Besides, the ethnics who has the smallest appearance of wrinkles is East Asians females followed by African Americans, Latinos, and Caucasians (Grimes *et al.*, 2004; Campiche *et al.*, 2019). This can be supported by Lym (2018) study focused on the characteristic of Asian skin among Chinese, Indian and Malaysian population. They found the major problem among Southeast Asian region as post-inflammatory hyperpigmentation (PIH) instead of wrinkle problem. Hence, this study will be conducted because there is no study focus on wrinkle formation among Malaysian based on the application of skin care product.

CHAPTER 3

METHODOLOGY

3.1 DATA COLLECTION

There are two types of data collection involved in this study which is primary and secondary data collection. Both of these data give significant information in this study.

3.1.1 PRIMARY DATA COLLECTION

Primary data collection is the collected or observed data by the researcher through a questionnaire, interview or photograph. This type of data collection could give specific information regarding the objective of the study. According to Hox & Boeije (2005), primary data collection is very important because it will provide specific and unique data since it was collected and observed practically by the researcher. In this study, face photography and questionnaire session will be conducted as the primary data collection to gather the information that can be further analysed in order to fulfil the study objectives.

3.1.1.1 INSTRUMENT DEVELOPMENT

This study investigated the relationship between the active ingredient in skin care product and facial crease among women in Universiti Sains Malaysia (USM). However, this study was focused on a small scope of the area which in USM only due to time limitation. Adult females aged in between 30-60 years old were invited to

participate in this study. Adult females aged 30 years old and above were considered to be prematurely aging at early of this age.

Furthermore, this research has been approved by the USM ethics committee (JEPEM Code: USM/JEPeM/19050295). The total number of respondents that have been decided to participate in this study was 102 female respondents. Before the participants were selected in this study, they required to fulfil all the inclusion criteria of the study. Healthy individual, healthy normal skin, no facial skin diseases, and non-smoker, non-alcoholic and willing to volunteer in this study were the inclusion criteria of this study.

However, if the participant does not fulfil any of these inclusion criteria, he or she will be excluded from being a participant in this study. Despite that, participant that has a visible skin disease, sensitive to the flash of light and do not undergo any aging treatments within the study period were the exclusion criteria in this study.

Before collecting the samples, the participants were informed regarding the purpose of the photograph and questionnaire to avoid any misunderstanding. After that, the chosen participant was asked to remove their make-up before taking their facial photograph. They need to be waiting for at least 10 minutes before the photograph session to ensure no active ingredient remain on their facial skin surface. Any accessory that can interfere with the clarity of the area of the crease was removed.

After removing all the items that can disturb the image of this creases, the participants need to keep their face as relaxed as possible to lose or avoid any additional temporary facial line. The instrument used for taking the photograph of face region was Nikon Digital Camera D90 as shown in Figure 3.1.1.1.1. The photograph distance between the camera and a participant was about 1 metre as shown in Figure 3.1.1.1.2.

The standardisation of lighting, angle and distance also must to be considered to avoid any conflict of the result. The face photograph was taken from the frontal view and oblique view from the left and right side of the face as in Figure 3.1.1.1.3, 3.1.1.1.4 and 3.1.1.1.5. The participants were asked to sit comfortably on the chair provided. The data collection was conducted at Sport Science Laboratory, Hospital Universiti Sains Malaysia (HUSM). Honorariums were given to all participants as a token of appreciation (Refer to Appendix 1 and Appendix 2).

Figure 3.1.1.1.1: Digital camera Nikon D90 used to take photograph of face region.

Figure 3.1.1.1.2: The standardised set-up for photograph session.

Figure 3.1.1.1.3: The example position of the participant for frontal view image.

Figure 3.1.1.1.4: The example position of the participant for left oblique view image.

Figure 3.1.1.1.5: The example position of the participant for right oblique view image.

In this study, nasolabial folds, infraorbital crease and horizontal forehead line were selected as the facial crease region for face analysis. After the photograph was taken, the image was cropped to focus on the crease region. Other than that, it helps to protect the participant's identity.

After cropping the areas of interest, the wrinkle was accessed by the wrinkle severity grading scale. For this study, the wrinkle severity grading scale was adapted from Tian (2018) study, as this scale is suitable for participants from the SEA region. This scale is classified from 0-5 grade, started from none (1), mild (2), moderate (3), severe (4) and extreme (5). Then, a standard photographic of each grade was given as a reference standard. The image of wrinkle of the participant was compared with the image of the reference standard. Intra-observer and inter-observer reliability were done to avoid any conflict of result and determine by statistical test.

3.2.2 SECONDARY DATA COLLECTION

Secondary data collection is the data collected from the beginning of this study for research purposes. This secondary data help in assisting the researcher to know and give more understanding towards the area of the study. According to Hox & Boeije (2005), the definition of secondary data is the data originally collected from the previous studies and reused for research purposes. Moreover, this type of data collection is very important and provides benefits in gathering all the relevant information or data according to the research purposes.

3.2.2.1 SEARCH STRATEGY

The articles were searched systematically from three different electronic databases that are Google Scholar, Science Direct, and PubMed. The searching method was performed and published articles until July 2020 was included. The search strategies were carried out based on the subject headings, topic and keywords for each database. The search term consisted of “facial crease”, “facial wrinkle”, “cosmetic”, “anti-aging skincare” and “women”. In order to minimize the inclusion of irrelevant articles, the searching strategies were modified by combining 2 keywords which were “facial crease and anti-aging skin care”, “facial wrinkle and anti-aging skin care”, “skin aging and cosmeceutical”, and “women and anti-aging skin care”. The reference of retrieved paper was used to identify the additional relevant papers. However, no search limit was applied and no hand searching of articles was performed because all the key terms were contained within the electronic database. After all the relevant articles were retrieved from the selected database, the articles were exported into Mendeley library to remove any duplicate articles.

3.2.2.2 INCLUSION CRITERIA

Aging is a universal irreversible process that commonly occurs along with the increasing of age. The formation of facial crease or wrinkle is one of the signs of aging process. The rapid development of anti-aging cosmetic can reduce and prevent the formation of crease and wrinkle. In this review, *in vitro* and *in vivo* studies that investigated the efficiency of the active ingredient in anti-aging cosmetic were included. Besides, any studies or published paper that involve skin aging, facial crease and facial wrinkle was included in this review. From the selected databases, the published paper was chosen based on the relationship between the facial crease and anti-aging cosmetic,