

# Effectiveness of Homemade and Commercialised Egg White Mask Amongst Medical Students of Melaka Manipal Medical College – A Parallel Randomized Controlled Study

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## Abstract

The high protein content in egg whites is one of the more essential components which makes it favourable for hair and skin treatment as protein is known for skin tightening and the ability to diminish oil on the skin. Apart from containing high levels of hyaluronic acid and hydrosylate enzyme, egg whites also contain vitamins and minerals which help in improving the skin's overall appearance. Hence, various cosmetic companies are producing egg whites products especially in the form of facial masks as egg whites have become one of the epitomes of beauty. A randomized controlled trial was conducted and 50 students were randomized into intervention group (n=25) where they received homemade egg white mask for two consecutive days and into control group (n=25) where they received commercialized egg white mask for two consecutive days. Evaluation of oiliness of skin was done before and after masks application in both groups by means of questionnaires and blotting paper tests. Unpaired t test was used for analysis. There was no significant difference in skin oiliness between the intervention group (homemade egg white mask) and the control group (commercialized egg white mask) after the application of both types of mask. However, participants in the group received homemade egg white mask for two consecutive days shows a significant difference in skin oiliness before and after application of mask. On the other hand, participants in the group received commercialised egg white mask for two consecutive days shows no significant difference in skin oiliness between before and after applying the commercialized egg white mask. Participants in the group received homemade egg white mask had given a positive feedback regarding significant increased in smoothness and reduction in pore size of the facial skin. Nevertheless, we also studied the effects of homemade and commercialised egg white mask on overcoming other dermatological problems such as blackheads, acnes and acne scars, pigmentations as well as pain from existing acnes. Homemade egg white mask gives a positive result to most of the dermatological problems mentioned in our study. In a nutshell, homemade egg white masks pose a good effect on the overall facial skin health. Egg whites are a good source of protein, vitamins, minerals and antioxidants which are beneficial for the skin. By including homemade egg white masks into skin care routine, it is proven to be a potent skin rejuvenating and smoothening agent.

## Keywords

Randomised Controlled Trial, Egg Whites, Mask, Face Mask, Homemade Mask, Commercialised Mask

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## 1. Introduction

Skin, though it might not be as vital as other organs such as the heart or the lungs, it still plays an integral role in the life of a human being. Besides its homeostatic function, it also acts as a barrier to the entry of microbes into the body as well as playing an important role on the aspect of aesthetics in which it has a psycho-social effect on people and this importance should never be looked past [1, 2].

This is how the existence of a paramount importance in maintaining skin health and protecting the skin from common skin conditions such as seborrhoea, acne vulgaris, black heads, white heads, dermatitis, large pores, dryness, and many other conditions that would affect skin health came to be. One of these conditions, seborrhoea, is a condition whereby there is over production of sebum which causes the skin to be greasy and oily. This excessive sebum production may lead to other dermatological conditions. Thus, explaining why oil control becomes one of the prime components in therapeutic regimens [3]. In certain cases, even people who believed that their skin is dry actually had oily skin when assessed with a sebumeter [4]. Without proper oil control, seborrhoea has detrimental effects to one's psychology, self-esteem, and social life where by an individual may feel embarrassed, and even annoyed because of the appearance of their oily skin [5]. Combating seborrhoea becomes a relatively daunting task especially when there is a mixture of the sebum with topical medications and cosmetics which disrupts the film-forming properties that are crucial for effective product functioning [3]. In treating seborrhoea, it is imperative that we assess the level of oiliness on different areas of the facial skin. The level of oiliness on the forehead, nose, cheeks and the chin could be measured using a sebumeter as the sebum secretion is not uniform throughout the entire face [1]. Normally, the average sebum secretion of the whole face is 118.7 - 180.9  $\mu\text{g}/\text{cm}^2$ , and the acidity is 5.6 - 6 due to the presence of acid in sebum, sweat and keratin. Figures above this may indicate seborrhoea [1]. It is imperative that the cosmetics and treatment used is suited to the skin type to ensure proper efficacy of the products in achieving a healthy skin [1]. Till date, there is no standard classification of facial skin types. However in the 1900's, a Polish-American businesswoman Helena Rubinstein has introduced four fundamental types of skin. This description has been used as a reference by numerous companies in the cosmeceutical industry ever since. Nevertheless, it is important to note that skin types do vary during a lifetime due to changes of sebum secretion as one continues to age. [1]

With that, countless measures have been thought up in intervening these impending threats to the skin such as face

masks, face creams, laser treatments, steam treatment, face massage and many more. In terms of skin rejuvenation however, facial masks are commonly used and has been one of the key components in maintaining the health and beauty of one's facial skin. It has been a beauty ritual practiced since ancient times by different civilizations [6, 7]. In the ancient Ayurvedic tradition of India, face masks have been practiced since 5000 years ago. They were called *ubtan*. *Ubtan* is made up of different natural ingredients such as flowers, herbs, roots and even various plants all in which they were portioned up according to the skin types. It started out as a ritual for religious festivities such as Diwali and the Haldi ceremony during Indian weddings [6]. However, as the years go by, people of the Indian subcontinent has begun to use face masks as part of a beauty ritual. Since the dawn of their civilization, Egyptians are very much well known and particular about their physical appearance. The concept of face masks made out of clay was the very first and most favourite amongst the wealthy Egyptians, especially Cleopatra. Apart from applying a Dead Sea mud face mask to cleanse her skin, Cleopatra also applied egg whites to tighten her pores to achieve a youthful look. Another prime example of face masks being practiced in different civilizations is of Yang Guifei. Yang is known as one of the Four Ancient Beauties of China, hailing from the Tang dynasty [6, 8-9]. She loved mixing and grounding up jadeite, pearls, ginger and even lotus root into powders to achieve a brighter complexion. It was said that Yang's masks became so popular that the ladies of the Emperor's court began practicing it as well. In ancient Rome, face masks has been an epitome of the Romans' beauty routine. Apart from oils, honey, vinegar, basil juice and goose fat, they have also used some rather exotic ingredients such as placentas or stools of animals like kingfishers and cows. In the middle ages, women across Europe hunted for ways and measures in having a flawless pale white complexion. This rage has led to creative and so far to inhumane beauty routines. The most infamous namely to be is applying the blood of calves or hares to their face. They believed that it would rejuvenate their skin and remove freckles. This craze has lasted till Renaissance. The pale look became even popular in the times of Elizabeth I. By now, women had resorted to even more dangerous means such as mixing toxins with honey and olive oil as face masks [6]. The most commonly used toxins are white lead [10]. However, as years evolved, the women of Renaissance era resorted to a safer means. They began using egg whites mixed with lemon juice to achieve their goal of pale white complexion [11, 12].

Face masks could be classified into sheet masks, peel-off masks, rinse-off masks and even hydrogels [1, 13, 14]. And within those classifications, it can be further divided into several categories. For example, a clay or mud mask is

considered as a rinse-off mask whereby you apply it onto your facial skin and rinses it after the allocated time [13]. An egg white mask however is a type of peel-off mask as after allowing it to set properly on the skin, you'll be able to peel it off gently instead of rinsing it like a rinse-off mask.

Face masks are known to be beneficial for the health and complexion of the skin. It helps by creating a barrier between the air around you and the product contained in the mask which is meant to be delivered to the skin [13, 15]. This will prevent the product from drying up due to evaporation, allowing it to penetrate into your skin even more. In a research published October 2016 on characterization and short-term clinical facial mask, it is concluded that the different clays tested in the study did not influence the skin biometric profiles because firmness and elasticity were not affected in a short-term application [4]. However, certain face masks are dubbed as an instant skin saviour. Many cosmeceutical companies have developed their signature face masks designed to be used as quick fixes [16].

There is always a question mark among aesthetes in regards of which mask serves better to facial skin, home-made masks, or commercialized masks? Homemade masks have been prepared and used long before commercialized products were made available. These masks are usually made from organic material such as cucumbers, strawberries, apples and even honey. These masks has been said to perform well in rejuvenating the skin as well as reducing inflammation. On further observation, we get to know there is a recent increase in the utilization of homemade masks [17]. Based on our assumption as youngsters, this may be due to the increasing prices implemented by all the professional commercialized masks and this has changed people's preference from chemically synthesized, industrially produced skin care products to opting products derived from natural resources [1, 13].

From others' perceptions, homemade masks are however found to be time consuming to prepare, with a questionable effectiveness and would vary in its efficacy depending on the expertise of the cook formulator. Homemade masks are also less favourable to some individuals as they need to be remade for each new application as the made ingredients for the masks do spoil if stored [17, 18]. Other than that, there are also no classifications on the materials used and its suitability for different types of skin [1].

There has always been a rising questions in regards of egg white masks. Egg whites contain good amounts of riboflavin and selenium in which riboflavin functions as antioxidants which helps break down free radicals. The high protein content in egg whites is one of the more essential components which makes it suitable for hair and skin care treatment where by the protein has skin tightening effects and

is able to diminish the oil on the skin by absorbing the excess oil produced [10, 12, 19]. The vitamins and minerals within egg whites can also improve the skin's overall appearance [10, 20]. Egg whites also contain high levels of hyaluronic acid and hydrolysate enzyme in which they can promote the action within dermal fibroblast. Hence, accentuating the skin by making it smooth and well moistened [10, 19, 21].

Commercialized masks on the other hand are favoured by the majority as it has a certain cosmetic elegance in which it is more convenient, and has a "deep" cleansing, sensuous effects on the skin [7, 18]. Moreover, commercialized masks are easier to apply, removed and are proven to take lesser time for the drying and hardening of the masks in the case of a peel-off mask [4]. Commercialized egg white masks for instance are easily available from dermatologist and even as easy as a simple drugstore. These commercialized face mask products had to meet a certain quality-control standard before they are made available to the public in which it gives consumers of these products a sense of security towards the effectiveness and safety of the use of these products which is very important especially to people who have sensitive skin [20, 22].

Commercialized skin care products are also sometimes found to contain several chemicals in order to meet the quality control standards that might prove to be detrimental to a person's health as the toxic chemicals in the products could invade an individual's blood, lymph system and organs which eventually may lead to a variety of diseases and illnesses [10, 22, 23].

In order to find out the effectiveness of homemade masks over commercialized masks, a randomised controlled study is made with the use of homemade egg white mask and commercialised egg white mask. In this study, we hypothesized that homemade egg whites masks are more effective in controlling the oiliness of skin than commercialised egg white masks.

## 2. Methodology

### 2.1. Study Design

We have conducted a randomized controlled trial concurrent parallel design in order to determine and compare the effectiveness of homemade egg white mask and commercialized egg white mask on the oiliness of skin amongst the medical students of Melaka Manipal Medical College (MMMC), Muar Campus, Muar, Johor, Malaysia.

### 2.2. Study Setting and Population

This study was done in Melaka Manipal Medical College in Muar, Johor, Malaysia in which a student population of 355

comprising of two batches (Batch 39, Batch 40) of 4<sup>th</sup> year students from Bachelor of Medicine & Bachelor of Surgery (MBBS).

### 2.3. Study Time

This study was held from October 2019 till November 2019.

### 2.4. Sample Size

A pilot study was done prior to the intervention to calculate the sample size needed. After the pilot study, we determined that the sample size required was 50. Among the 50 participants, 25 participants were randomized into intervention group where they received homemade egg white mask for two consecutive days. Another 25 participants were randomized into control group where they received commercialized egg white mask for two consecutive days. Data were then collected, recorded and analyzed by using Microsoft Word and Microsoft Excel.

### 2.5. Sampling and Randomization

In this study, our study population consists of 355 students where by 52 students had participated in our study voluntarily. The participants were then filtered and selected according to our inclusion and exclusion criteria as shown in *Table 1*. After exclusion of all the participants who did not meet the inclusion criteria, the leftover participants were 48 of them. These 48 students were then grouped into male and female group using stratified randomization method. There are 28 female participants and 20 male participants. Each male and female group were then randomized using software called Research Randomizer (<https://www.randomizer.org>) into two groups.. The sampling and randomization method were summarized in Consort Flow Diagram as shown in *Figure 1*. For female, the total number of participants was 28 and hence was divided into 14 sets; for male, the number of participants was 20 and was divided into 10 sets.

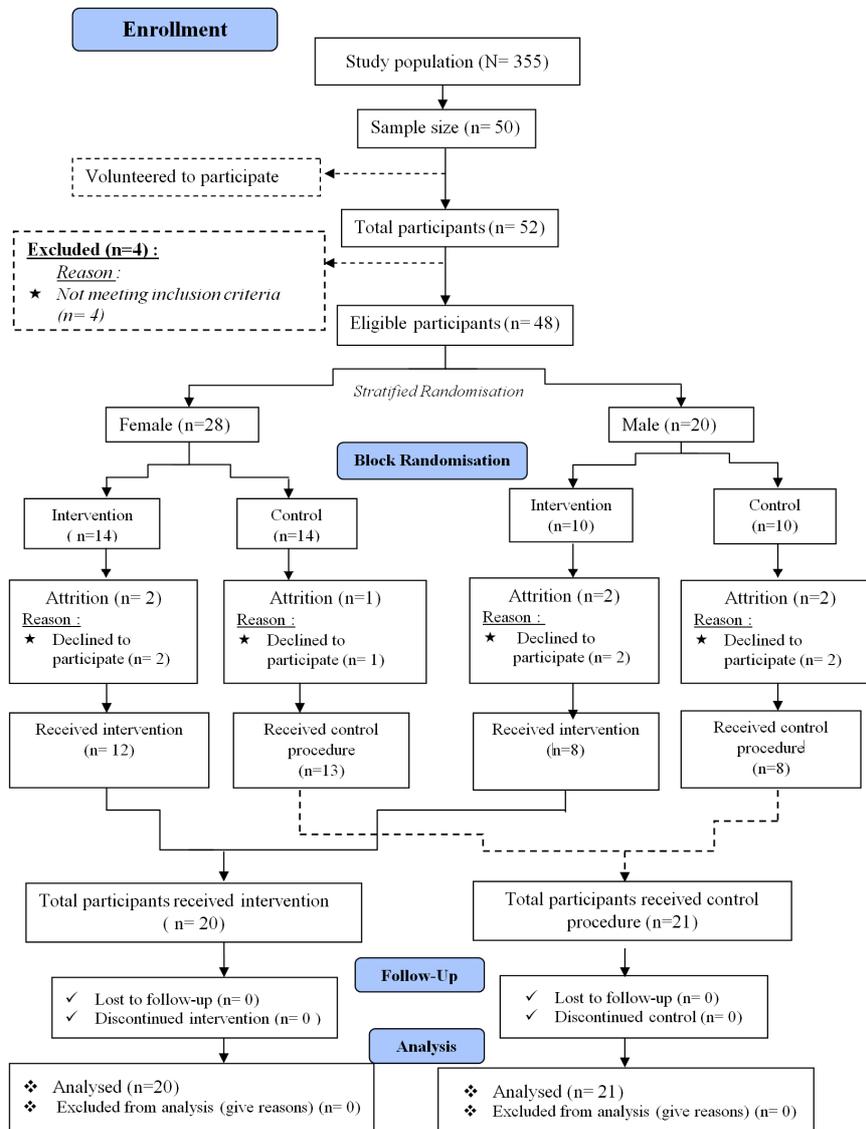


Figure 1. Consort Flow Diagram.

**Table 1.** Inclusion and exclusion criteria.

Inclusion criteria	Exclusion criteria
Inform consent provided	Those who do not provide informed consent
Age range > 18 years old	Allergy reaction to raw eggs
Both gender	Unable to withstand raw eggs smell
Any ethnicity including international students	Chronic skin disease such as psoriasis, eczema etc.
All skin types	Decline participation
People with facial hair and moustache	

## 2.6. Intervention Procedure

Our aim was to compare the effectiveness of the home-made egg white mask and commercialised egg white mask with our intervention being home-made egg white mask while the control being commercialised egg white mask.

We promoted our research study by conducting an informal promoting session in the college’s cafeteria and also through various social media platforms. Participation in our research was entirely voluntary. An informed consent was also given to the participants before the intervention.

The demographic data and dermatological history were obtained by the researchers few days before the intervention. By using data provided by the participant with consideration of the inclusion and exclusion criteria, those who did not fulfil the criteria were excluded from this study while the others who met all of the criteria were taken as subjects in our study.

We used a six-item skin oiliness scale (SOS) which is a validated questionnaire consists of six questions to determine the skin oiliness of all the participants before any interventions given.

First question in SOS is about how the participants feel or how their skin appear after 2-3 hours of washing their face and without application of any cosmetic or skin care product, options provided were: a) very rough, flaky or ashy, b) tight, c) well-hydrated with no reflection of light, d) shiny with reflection of bright light. Second question is about how participants will characterize their facial skin, options provided were: a) dry, b) normal, c) combination and d) oily. Third question is about the oiliness of participant’s forehead and nose regarded as T-zone, options provided were: a) never, b) sometimes, c) frequently and d) always. Forth question asked was if participants have clogged pores which are usually seen as blackheads and whiteheads, options provided were: a) never, b) rarely, c) sometimes and d) always. Fifth question asked was in regards of how soon participant’s T-zone become oily after washing their face, options provided were: a) never, b) > 5 hours after washing, c) 2-4 hours after washing, d) 1 hour after washing and e) oily all day no matter how frequent participants wash their face. Sixth question asked was about the number of times participants wash their face, options provided were: a) do not wash face every day, b) 1 time a day,

c) 2 times a day, d) 3 times a day and e) > 4 times a day. In SOS scale, for every ‘a’ answer, it is graded as 1 point, for every ‘b’ answer is 2 points, for every ‘c’ answer is 3 points, for every ‘d’ answer is 4 points, and for every ‘e’ answer is 5 points. The total SOS score is the summation of score obtained from each question. The higher the total SOS score, the oilier the participants skin [23]. SOS scale allowed researchers to make an assumption about the oiliness of skin in our sample population. Participants were also asked to grade the oiliness of their facial skin with a scale of grade 1 to grade 5 in which grade 1 indicates not at all oily, grade 2 – mildly oily, grade 3 – oily, grade 4 – severely oily and grade 5 – very severely oily.

Other than that participants were asked to answer a series of questions based on their own perceptions about their skin condition. These questions were separated into 3 parts and are a yes / no questionnaire; participants have to tick on either yes / no for each of the variables stated in those 3 parts. The first part of the questionnaire was in regards of how participants feel about their facial skin when they touch it with variables provided such as do they feel smoothness, roughness, oiliness, bumpiness, dryness and even tackiness of their skin. Second part of the questionnaire was regarding the perception about their skin when they look into mirror and if there were any acnes, acne scars, pigmentation, large pores, blackheads and do their facial skin appear shiny or flaky all the time. The third part of the questionnaire is regarding how participants feel about the condition of their facial skin without even touching them, do they feel pain from existing acnes, tightness, heavy, greasy or even clogged. This enabled the researchers to know participants’ skin condition subjectively before the interventions. On completion of the questionnaires, participants were then assessed by researchers on the oiliness of their skin by using blotting papers (1 big piece cut into 4 quarter). The areas assessed by the researchers were cheeks and the T-zone of the face (the oiliest part of the face) as shown in *Figure 2*. Blotting paper will turn transparent when they are in contact with oil. By stroking the blotting papers on cheeks and T-zone of face until the following blotting paper used were no more transparent which indicates no more oil on the parts upon repeated stroking with blotting papers, we calculated the amount of blotting paper used by the participants in terms of quarter and noted down in participants’ questionnaires.



**Figure 2.** Areas where oiliness of skin were assessed and face mask were applied -- Green area: T zone; Purple area: cheeks [32].

With that all, we started interventions on all the participants the next day itself. Intervention group were given homemade egg white mask while controlled group were given commercialised egg white mask. Before applying the mask, participants were asked to clean their face to get rid of oil and dirt. The area where we applied the face mask for both gender are shown in *Figure 2*. Due to the issues that some of the male participants with more facial hair, application of face mask around the mouth area may cause uncomfortable, pain and minor injury to that area as this is a peel off mask. Therefore, the mouth area was purposely avoided in both genders. The procedures of applying both types of mask on participants are as follow:

### 2.6.1. Homemade Intervention Procedure

The ingredients we used to make the mask were square facial cotton puff (each thick pieces separated into 4 thinner piece) and eggs (only egg white used, egg yolk was discarded).

First of all, we applied a layer of egg white on subject's facial skin avoiding eyebrows, eyes, nostril and moustache. The area where we applied the face mask is shown in *Figure 2*. Then, we covered the area where the egg whites were applied with a layer of facial cottons. Next, we applied another layer of egg white on the top of the layer of the facial cotton covering the facial skin. This extra layer of egg white made the cotton fully wet hence allowed the fluffy cotton to attach to one another forming a strong & stiff mask with a proper facial mask shape. Moreover, the wet cotton also firmly attached to the facial skin allowing the absorbed egg white on the cotton to slowly infiltrate into facial skin. Following that, we asked our participants to let the mask dry completely which took about 45 minutes to an hour. Once the mask has dried, they were told to peel of the mask and wash their face.

These procedures were carried out for two consecutive days as per suggested [24].

### 2.6.2. Commercialised Procedure

The product we used in this procedure was a brand of commercialised egg white mask purchased from a skin care shop in Malaysia. The content of this mask are Albumen, Hydrolyzed Elastin and Collagen.

A thick layer of the mask cream was evenly applied across participant's face avoiding the eyebrows, eyes and mouth area. Then participants were told to let the mask dry completely which took about 15 minutes to 20 minutes. When the mask dried, they were told to peel it off and wash their face. These procedures were carried out for two consecutive days.

After 2 days of these interventions, we reassessed the participant's skin in both intervention and controlled group to know and compare the effect of the 2 types of mask by using a questionnaire which consist of a series of questions regarding participant's perception about improvement in various aspect of their skin condition and any adverse effect of the procedure on them. Grading of the oiliness of facial skin and blotting test were done at the same time to see if there is any reduction in the oiliness of their facial skin after the interventions.

## 2.7. Data Collection

### 2.7.1. Before Intervention

Before the day of intervention, we did data collection using questionnaires and assessment of skin oiliness using blotting test in the evening immediately after class for all the participants. Participants in both intervention and controlled group (n=48) were asked to complete the six-item skin oiliness scale (SOS) questionnaire along with the self-grading of the oiliness of their skin (Grade 1 to Grade 5). Participants were also asked to answer a series of questions which helps researcher to know participants skin condition subjectively before the interventions.

To complete the questionnaires, participants were asked to touch their facial skin to feel whether it is rough, oily, bumpy (with acne), dry and tacky / sticky. Then, participants were asked to look into mirror to see if there is any acne, acne scars, pigmentations, large pores, blackheads / whiteheads on their face and also see if their face appear oily or flaky (skin crack and falling off from face due to dryness). Last part of this questionnaire is based on how the participants feel about their skin condition without seeing and touching it.

On completion of the questionnaires, participants were then assessed by researchers on the oiliness of their skin by using blotting papers (1 big piece cut into 4 quarter). The areas assessed by the researchers were cheeks and the T-zone of the face as shown in *Figure 2*. Blotting paper will turn transparent when they are in contact with oil. We calculated the amount of blotting paper used by the participants in terms of quarter and noted down in participants' questionnaires.

### 2.7.2. After Interventions

After 2 days of intervention, to interpret and compare the effectiveness of the homemade egg white mask and the

commercialised egg white mask respectively, we did data collection using questionnaires and reassessment of skin oiliness using blotting test in the evening immediately after class for all the participants in both the intervention and controlled group. A questionnaire was answered by each of the participants. This questionnaire consist of a series of questions regarding participant's perception about improvement in multiple aspects of their skin condition and any adverse effect of the procedures on them. To answer the questionnaire, participants were asked to repeat the same procedure which is touch and feel their facial skin, look at the condition of their skin in a mirror and feel the condition of skin without even touching and looking it to see if there is any improvement in the skin condition in all the aspects we were interested in as mentioned above. Self-grading of the oiliness of facial skin and blotting test were done at the same time to see if there is any reduction in the oiliness of their facial skin after the interventions. Same procedure was done for the blotting test as mentioned above by researchers. We calculated the amount of blotting paper used by the participants in terms of quarter and noted down in participants' questionnaires.

Participant's name was noted down in all of the before and after questionnaires. Each of the participants's before and after questionnaires were then filed together as one for easy referral during data analysis and interpretation.

### 2.7.3. Data Collection Tools

We used a six-item skin oiliness scale (SOS) which is a validated questionnaire consist of six questions to determine the skin oiliness of all the participants before any interventions given.

First question in SOS is about how the participants feel or how their skin appear after 2-3 hours of washing their face and without application of any cosmetic or skin care product, options provided were: a) very rough, flaky or ashy, b) tight, c) well-hydrated with no reflection of light, d) shiny with reflection of bright light. Second question is about how participants will characterize their facial skin, options provided were: a) dry, b) normal, c) combination and d) oily. Third question is about the oiliness of participant's forehead and nose regarded as T-zone, options provided were: a) never, b) sometimes, c) frequently and d) always. Forth question asked was if participants have clogged pores which are usually seen as blackheads and whiteheads, options provided were: a) never, b) rarely, c) sometimes and d) always. Fifth question asked was about how soon participant's T-zone become oily after washing their face, options provided were: a) never, b) > 5 hours after washing, c) 2-4 hours after washing, d) 1 hour after washing and e) oily all day no matter how frequent participants wash their face. Sixth question asked about the number of times participants wash their face, options provided were: a)

do not wash face every day, b) 1 times a day, c) 2 times a day, d) 3 times a day and e) > 4 times a day. In SOS scale, for every 'a' answer is considered as 1 point, for every 'b' answer is 2 points, for every 'c' answer is 3 points, for every 'd' answer is 4 points, for every 'e' answer is 5 points. The total SOS score is the summation of score obtained from each question. The higher the total of SOS scores, the oilier the participants skin [23]. SOS scale was only filled once in this study before our intervention and this allowed researcher to make an assumption about the oiliness of skin in our sample population.

Participants were also asked to grade the oiliness of their facial skin with a scale of grade 1 to grade 5 in which grade 1 indicates not at all oily, grade 2 – mildly oily, grade 3 – oily, grade 4 – severely oily and grade 5 – very severely oily. Participants were asked to grade before and after the intervention to know the effectiveness of home-made egg white mask meanwhile comparing its effectiveness with commercialised egg white mask.

A series of questions were made to be answered by the participants based on their own perceptions about their skin condition. These questions were separated into 3 parts and are a yes / no questionnaire; participants have to tick on either yes / no for each of the variables stated in those 3 parts. The first part of the questionnaire was regarding how participants feel about their skin when they touch their skin with variables provided such as do they feel smoothness, roughness, oiliness, bumpiness, dryness and tackiness of their skin. Second part of the questionnaire was regarding the perception on their skin when they look into mirror if there were any acnes, acne scars, pigmentation, large pores, and blackheads and does their facial skin appear shiny or flaky all the time. The third part of the questionnaire is regarding how participants feel about the condition of their facial skin without even touching them, do they feel pain from existing acnes, tightness, heavy, greasy or even clogged. This enabled the researchers to know participants skin condition subjectively before the interventions.

On completion of the questionnaires, participants were then assessed by researchers on the oiliness of their skin by using blotting papers (1 big piece cut into 4 quarter). The areas assessed by the researchers were cheeks and the T-zone of the face (the oiliest part of the face) as shown in *Figure 2*. By stroking the blotting papers on cheeks and T-zone of face until the following blotting paper used were no more transparent which indicates no more oil on the parts upon repeated stoking with blotting papers, we calculated the amount of blotting paper used by the participants in terms of quarter.

### 2.8. Data Processing and Analysis

For data analysis, data collected from our questionnaires

were exported and tabulated using Microsoft Excel version 2007 and the values were double checked to prevent any error that can cause a deviation in results. From Microsoft Excel, the information were then used for statistical calculation using analytical software Epi Info version 7.2 from Centre For disease control and prevention website (CDC) and Graph Pad, Prism.

For descriptive statistical analysis, we included mean, standard deviation (SD), frequency and percentage. Mean and standard deviation were used to analyze ages, sleep duration, SOS score, number of blotting paper used to assess skin oiliness of all the participants. A table was drawn for demographic details and dermatological history to describe the frequency and percentage between intervention and control group. Frequency and percentage were also used to analyse various variables in comparing the effectiveness of homemade egg white mask and commercialised egg white mask, the 2 measures were also used to analyse self grading of skin oiliness between intervention and control group. Measure of association was done using relative ratio (RR). The level of significance was set at 0.05, in which any P-values more than 0.05 were considered not statistically significant. Mean plot were used to represent the data in comparing the skin oiliness between intervention group and control group. Bar charts were used to represent the data in comparing the skin oiliness in each intervention and controlled group before and after the procedure in each group. Unpaired t-test was used to compare the skin oiliness between control and intervention group. Paired t test was used to compare the skin oiliness between

before and after in both intervention and control groups.

## 2.9. Ethical Consideration

An informed consent form with all the important relevant details of the study was given to the participants. The form also had a clear explanation about the study and some advices were also stated for the participants. The participation in this study were self-volunteered, the participants were in no way coerced into participating. Participants who were allergic to eggs and cannot withstand raw egg smell were advised not to participate as per stated in the inform consent and they were excluded from this study to prevent unnecessary allergy reaction that may bring to life threatening complications. The participants were also told that they could withdraw from the study whenever they felt needed to do so without providing any reasons. Participants were notified that all the personal data and information provided to support this study would be kept confidential. This study has included the questionnaires generated by us, which was approved by the Research Ethics Committee, Faculty of Medicine, Melaka Manipal Medical College, Muar Campus.

## 3. Results

Table 2 shows the comparison of result in various variables between intervention group who received homemade egg white mask and the control group who received commercialised egg white mask.

**Table 2.** Comparison of result in various variables between intervention group (homemade egg white mask) and the control group (commercialised egg white mask).

Variables	Result	Intervention n (%)	Control n (%)	RR (95% CI)	$\chi^2$ Chi-square	P-value
Improvement in skin oiliness	Improved	14 (70)	8 (38.10)	1.84	4.19	0.041
	Not improved	6 (30)	13 (61.90)	(0.99, 3.40)		
Pore size	Improved	10 (50)	8 (38.10)	1.31	0.59	0.443
	Not improved	10 (50)	13 (61.90)	(0.65, 2.64)		
Tackiness of skin	Improved	7 (35)	6 (28.57)	1.22	0.20	0.658
	Not improved	13 (65)	15 (71.43)	(0.50, 3.02)		
Presence of blackheads	Improved	16 (80)	9 (42.86)	1.87	5.94	0.015
	Not improved	4 (20)	12 (57.14)	(1.09, 3.20)		
Smoothness of skin	Improved	11 (55)	6 (28.57)	1.93	2.95	0.086
	Not improved	9 (45)	15 (71.43)	(0.88, 4.22)		
Dryness of skin	Improved	12 (60)	10 (47.62)	1.26	0.63	0.427
	Not improved	8 (40)	11 (52.38)	(0.71, 2.24)		
Acne	Improved	7 (35)	1 (4.76)	7.35	5.96	0.015
	Not improved	13 (65)	20 (95.24)	(0.99, 54.52)		
Acne scar	Improved	6 (30)	1 (4.76)	6.30	4.61	0.032
	Not improved	14 (70)	20 (95.24)	(0.83, 47.80)		
Pigmentation on skin	Improved	6 (30)	1 (4.76)	6.30	4.61	0.032
	Not improved	14 (70)	20 (95.24)	(0.83, 47.80)		
Pain from existing acne	Improved	9 (45)	2 (9.52)	4.73	6.57	0.010
	Not improved	11 (55)	19 (90.48)	(1.16, 19.25)		
Tightness of skin	Improved	13 (65)	10 (47.62)	1.37	1.26	0.262
	Not improved	7 (35)	11 (52.38)	(0.79, 2.37)		
Clogged pores	Improved	13 (65)	9 (42.86)	1.52	2.02	0.155
	Not improved	7 (35)	12 (57.14)	(0.84, 2.73)		

According to the Table 2, the participants who experienced improvement in the skin oiliness (reduction in skin oiliness) in intervention and control group were 70% and 38.10% respectively. However, 30% of participants in intervention group and 61.9% of participants in control group have given a negative feedback that there was no improvement in skin oiliness after the application of masks. The relative ratio (95% CI) calculated for the improvement in skin oiliness was 1.84 (0.99, 3.40), which means participants who received homemade egg white mask were 1.84 times more likely to have improvement in skin oiliness compare to participants who received commercialised egg white mask. The chi-square and P value computed for the improvement in skin oiliness were 4.19 and 0.041 respectively. This shows that there was a significant difference between the intervention and control group in the improvement of skin oiliness after application of masks.

The participants who experienced an improvement in presence of blackheads (reduction of blackheads) in intervention and control group were 80% and 42.86% respectively. However, 20% of participants in intervention group and 57.14% of participants in control group have given a negative feedback that there was no improvement in tackiness of skin after the application of mask. The relative ratio (95% CI) calculated for the improved presence of blackheads was 1.87 (1.09, 3.20), which means participants who received homemade egg white mask were 1.87 times more likely to have improvement in the presence of blackheads compare to participants who received commercialised egg white mask. The chi-square and P value computed for the reduction in blackheads were 5.94 and 0.015 respectively. This shows that there was significant difference between the intervention and control group in the reduction of blackheads after application of masks.

The participants who experienced a reduction of acne (improvement in acne) in intervention and control group were 35% and 4.76% respectively. Majority of the participants showed that there was no improvement in acne, in which there was 65% in intervention group and 95.24% in control group. The relative ratio (95% CI) calculated for the improvement in acne was 7.35 (0.99, 54.52), which means that participants who received homemade egg white mask were 7.35 times more likely to experience an improvement in acne compare to participants who received commercialised egg white mask. The chi-square and P value computed for the improvement in acne were 5.96 and 0.015 respectively. This shows that there was a significant difference between the intervention and control group in the improvement of acne after application of masks.

Participants who showed improvement in acne scar (acne scar appear lighter) in intervention and control group were 30% and 4.76% respectively. However majority of the participants showed that there was no improvement in acne scar, in which there was 70% in intervention group and 95.24% in control group. The relative ratio (95% CI) calculated for the improvement in acne scar was 6.30 (0.83, 47.80), which means participants who received homemade egg white mask were 6.30 times more likely to experience improvement in acne scar compare to participants who received commercialised egg white mask. The chi-square and P value computed for the improvement in acne scar were 4.61 and 0.032 respectively. Hence, there was significant difference between the intervention and control group in the improvement of acne scar after application of masks.

Only minority of the participants had experience an improvement in pigmentation of skin in which there was 30% in intervention group and 4.76% in control group respectively. Most of the participants showed that there was no improvement in pigmentation of skin, in which there was 70% in intervention group and 95.24% in control group. The relative ratio (95% CI) calculated for the improvement in pigmentation of skin was 6.30 (0.83, 47.80), which shows that participants who received homemade egg white mask were 6.30 times more likely to experience an improvement in pigmentation of skin compare to participants who received commercialised egg white mask. The chi-square and P value computed for the improvement in pigmentation of skin were 4.61 and 0.032 respectively. Therefore, it shows a significant difference between the intervention and control group in the improvement of pigmentation of skin after application of masks.

Only minority of the participants had experienced a reduction in pain from existing acne in which there was 45% in intervention group and only 9.52% in control group. Majority of the participants showed that there was no reduction in pain from existing acne, in which there was 55% in intervention group and 90.48% in control group. The relative ratio (95% CI) calculated for the reduction in pain from existing acne was 4.73 (1.16, 19.25), which means participants who received homemade egg white mask were 4.73 times more likely to experience a reduction in pain from existing acne than participants who received commercialised egg white mask. The chi-square and P value computed for the reduction in pain from existing acne were 6.57 and 0.010 respectively. Hence, there was a significant difference between the intervention and control group in reduction of pain from existing acne after application of masks.

**Table 3.** Comparison of skin oiliness before and after intervention the in intervention group (homemade egg white mask).

Outcome variables	Mean (SD)		Mean difference (95% CI)	t-statistics (df)	P - value
	Before	After			
Skin oiliness (Number of blotting papers used)	2.35 (1.64)	1.55 (1.28)	0.80 (0.37, 1.23)	3.87 (19)	0.001

Table 3 shows the comparison of skin oiliness before and after intervention in the intervention group who received home-made egg white mask.

The skin oiliness was assessed in terms of the number of blotting papers used by the participants before and after the intervention. Before the intervention, the mean number of blotting papers used was 2.35 (SD= 1.64) while the mean

number of blotting papers used after the intervention were 1.55 (SD= 1.28). The mean difference (95% CI) and t-statistics (df) are 0.80 (0.37, 1.23) and 3.871 (19) respectively. The P-value is 0.001. Hence there is a significance difference in the skin oiliness of the participants before and after the interventions in our intervention group.

**Table 4.** Comparison of skin oiliness before and after the in control group (commercialised egg white mask).

Outcome variables	Mean (SD)		Mean difference (95% CI)	t-statistics (df)	P - value
	Before	After			
Skin oiliness (Number of blotting papers used)	1.86 (1.01)	1.48 (0.60)	0.38 (-0.03, 0.79)	1.95 (20)	0.065

Table 4 shows the comparison of skin oiliness before and after application of mask for our control group who received commercialised egg white masks.

Skin oiliness in our study was assessed in terms of the number of blotting papers used by the participants before and after the application commercialised egg white mask in control group. Before the application of mask, the mean number of blotting papers used was 1.86 (SD= 1.01) while the mean number of blotting papers used after the intervention were 1.48 (SD= 0.60). The mean difference (95% CI) and t-statistics (df) calculated were 0.38 (-0.03, 0.79) and 1.95 (20) respectively. The P value computed was 0.065. This shows that there was no significance difference in the skin oiliness of the participants before and after application of mask in our control group.

## 4. Discussion

A randomized controlled trial concurrent parallel design was done amongst the medical students from Melaka Manipal Medical College in order to determine and compare the effectiveness of homemade egg white mask and commercialized egg white mask on the oiliness of skin.

We assessed the oiliness of facial skin of all the participants before and after our interventions using blotting papers. Blotting test has been regarded as an easy way to determine the skin type and skin oiliness in few articles, which prompted us to include blotting papers as an assessment tool in our study. Blotting papers will turn transparent when it is in contact with oil. By gently patting the blotting papers on cheeks and T-zone of face (the oiliest part of the face), we calculated the amount of blotting papers used by the participants to get a subjective results in regards of the oiliness of skin. The more the number of blotting papers used,

the oilier the participant's skin.

We found that there were no significant differences in skin oiliness between intervention and control group after application of the masks for two consecutive days. However, when comparison was done within intervention group itself, there was a significant difference in skin oiliness between before and after application of natural egg white mask. This gives a positive result showing that homemade egg white mask plays a role in controlling the skin oiliness within a short period of time. For the group received commercialized mask, there was no significant difference in skin oiliness between before and after intervention. This indicates that the commercialized egg white mask have limitation in controlling skin oiliness in short period of time and is not as effective as homemade egg white mask. We also found that there was a significant difference between intervention and control group showing the homemade egg white mask were more likely to give an improvement in skin oiliness, pore size, clogged pores, blackheads (improvement indicated reduce in blackhead), smoothness, dryness and tightness of skin. However there is no significant difference between intervention and control group in the improvement of pore size, tackiness, smoothness, dryness and tightness of skin. Moreover, egg whites are high in proteins which act as a humectants that attract water, proteins from egg whites will be absorb into skin surface and it traps the water molecules close to the skin surface, this made an improvement in the dryness of skin and the skin ultimately become hydrated. Egg whites also rich in lysozyme which is an antibacterial compound, lysozyme helps in destroying and killing acne-causing bacteria therefore giving an improvement in acne prone skin and helps in reducing pimples. Egg whites are rich in antioxidant helps in reversing the sign of aging like wrinkles and loss of elasticity and brings a tightening effect to the skin, helps in skin lifting hence giving a better

appearance to users [25]. Antioxidant also helps in fighting free radical damage due to UV exposure hence improving the overall health of facial skin [25].

Some of our participants experienced adverse effects due to the application of masks. Among all of the participants in the group receiving natural egg white mask (n=20), only one participant experienced allergy to the homemade egg white mask. On the other hand for all of the participants in the group received commercialized egg white mask, one of the participants experienced skin allergy and also worsening of acne due to application of commercialized egg white masks. Four (19.05%) of the participants that received commercialized egg white mask also experienced an increase in dryness of skin after application of the mask. Commercialized mask are known to contain some amount of irritating chemical, for example, it is found that some of the commercialized peel off mask contain strong glue which can cause chemical burns to the skin and eventually damage the skin. Other than that, commercialized peel off mask has a strong oil-stripping effect on the facial skin after application. With repeated use of the product, it can lead to stripping off of all the natural oil from facial skin, hence increasing the skin's sebum production to cover up the natural oil loss. Excessive production of sebum on the facial skin will then lead to more clogged pores and further worsening of acne. Moreover, losing the layer of natural oil from skin causes the disruption of function of skin as a barrier to prevent water loss and irritation due to environmental exposure which eventually lead to dryness and flaking of skin [26, 27].

There were some limitations in our study. Due to time limitation, our intervention period was only 2 days; this short period of intervention might not show effect on some of the participant's skin. Ideally, a planned cross-over study design would favor our study and help us to get a more precise data, for the reason of time limitation. Because there was not enough time for the wash out period, hence only parallel design can be done. Furthermore, we have a small sample size and the attrition rate was high as for intervention group was 16.67% while the attrition rate for control group was 12.5%. Furthermore, due to financial constraints, an in-depth analysis of various skin conditions, ideally a full skin assessment could not be done for all the participants before and after the intervention using specific skin assessment machine available in dermatological clinics. Instead we used a subjective scale (SOS scale) and blotting paper test to assess the skin oiliness of all the participants before and after the interventions. A subjective questionnaire was also prepared to rule out any improvement in the skin condition after the interventions.

For future study to be done in this topic, we suggest a bigger sample size in a more diverse population and also a longer

duration of interventions. Furthermore, a more objective measurement regarding various skin condition should be done by esthetician before and after the interventions, for example check for skin oiliness using sebumeter and an in-depth analysis of skin conditions using magnifying lamp to get a more objective data regarding the effectiveness of the our interventions.

From this research, we get to know that homemade egg white mask only cause some adverse effect in minority of people. However its effectiveness on various skin conditions was an eye-opening to us. It helps in controlling the skin oiliness, reducing blackheads, acne and pigmentation on the skin hence gives a good feedback on skin smoothening effect of the homemade egg white masks. Other than that, participants with complaint of chronic skin illness and sensitive skin to various cosmetic products appeared to be able to adapt to the homemade egg white mask with a positive feedback after the interventions. By taking the possible adverse effects of homemade egg white mask and its effectiveness shown in this study into consideration, we would like to recommend home-made egg white mask for all the population experiencing uncontrolled facial skin oiliness, unresolved and prolonged skin roughness and also to the population who are experiencing problem in adapting to various cosmetic products in the market in which the exact content of those products were mostly unknown.

## 5. Conclusion

In conclusion, home-made egg white mask using natural raw egg whites can give a significant improvement in various aspect of skin. It was found to be useful for skin tightening hence reducing the pore size. It is also known for effective control of skin oiliness and effective removal of blackheads thus giving a smoothening effect to the skin after application of the mask. The home-made egg white mask may be ideal for community as it shows a significant improvement on facial skin within a short period of time. More importantly, home-made egg white mask were found to be suitable for those who were suffering chronic skin illness and for those whose skin appeared to be very sensitive to other cosmetic products sold in the markets with unknown content.

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