International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 5 Issue 4, April - 2021, Pages: 267-276

The Contactless Surgical Mask Holder with an Automotive Alcohol Dispenser (CSMH-AAD)

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Abstract: *this study is an experimental research design that focuses on innovating a contactless surgical mask holder with an automotive alcohol dispenser. But the evaluation of CSMH-AAD is limited due to community quarantine. Surgical mask is a single-short-time use, meaning it has to be replaced immediately, therefore the primary function of the device is to give service without having any contact to the pump, and/or switch and a clean replacement on the disposed mask in order to promote a hygienic lifestyle. However, the product undergone a processes; Purposive Sampling method was used in selecting seven people to partake in the interview about CSMH-AAD's serviceableness. Their answers were reviewed and investigated through Code and Theme analysis. Inexpensive materials were used to construct the product, so that it may be sold in public with inexpensive, low-cost and reasonable price. Given the benefit of surgical mask, issues still occur and these are: shortness of breath, skin irritation and discomfort, manufacturing defect and elastic band's durability, and gaps in coverage capacity of the mask. However, it was concluded that CSMH-AAD is still efficient and can be accepted to the market, but on the other hand, durability of CSMH-AAD is quite questionable and is subject for improvement, so a more concrete materials is highly recommended to apply in the product. Other recommendations are to upgrade the design, sell the product with accurate and deserving cost, lastly, assess the device and enlist everything that will be needing an improvement to serve as guidance. Authors also recommended innovative structural design and advanced function that can be possibly done by other researchers.*

Keywords—— Contactless Surgical Mask Holder, Automotive Alcohol Dispenser, Experimental research design, Code and Theme Analysis, Thematic Analysis, Thematic Coding

1. INTRODUCTION

People must recognize the idea of prevention is better than cure. In order to keep from having diseases there are health measures to prevent the spread of it suchlike maintaining cleanliness – hygiene; investigation of environmental sources – avoidance of the source; and improve surveillance for infectious diseases - being knowledgeable about the disease and appropriate medical products to use [1].

Usually, proper sanitation and surgical mask are the medical products needed to prevent diseases or even performing any health related task. Wearing of surgical mask is a must when a person is experiencing a flu or being exposed in a crowded places and this will cover nose and mouth which are possible pathway of virus and/or disease. Masks could perhaps be considered as part of a major transmission suppression and life-saving plan [2].

Considering the current situation, innovations of automotive, contactless and enhanced equipment are at the trend since diseases are keep branching out several kinds and types that often transmitted by direct contact, therefore innovators created things that could avoid interaction or contacts. Thus, the objective of the study is to create a contactless and profitable surgical mask holder with an automotive alcohol dispenser. According to WHO's guidance of wearing a mask, spraying an alcohol on the hands should be done before and after wearing a mask [3], so innovating an equipment of two in one that promotes both hygiene and security to the health may be much more effective to prevent diseases.

Scope and Delimitation

This study is limited to the evaluation of CSMH-AAD's reliability during this pandemic where the measure of contact and distance between persons and the measure of cleanliness in equipment and in hygiene, play a significant role in minimizing the chances of contracting diseases, especially the coronavirus disease. In addition, five types of masks will be assessed for their efficiency and durability as the best will be included in the contents of CSMH-AAD.

This research aims to consider every aspect of CSMH-AAD such as the possibility for it to enter the market with the cost of its materials, ease of use, functionality, and quality. These are the factors that will determine CSMH-AAD's reliability. Respondents with engineering backgrounds were interviewed for their feedback with CSMH-AAD's improvement.

2. RELATED WORKS

Diseases and innovations of medical products and equipment are proportionate to each other because when a disease levelled up and so is the medical products and equipment are upgraded such as the innovations in alcohol

spray and dispenser. From manual spray to automatic mist spray disinfectant to rechargeable UV disinfectant wand to wireless disinfection blue light nano spray gun to robotic vacuum cleaner disinfectant and from pump based dispenser to automatic alcohol dispenser and to thermal scanner with alcohol dispenser. As observed, the devices has an automotive and sensor aspects to avoid contact and to appear safer so that, many people can be prevented from having contact with the pump handle, thereby avoiding viral transmission and enabling the use of hand sanitizer even more beneficial [4].

Moreover, face masks are constantly evolving in a span of time because during disease outbreak, face mask has been required to use. Commonly, these mask are dust mask or FFP1 (fig. 1), N95 or FFP2 (fig. 2), hand-sewn or cloth mask (fig 3), copper mask (fig 4), and lastly surgical or medical mask (fig. 5) [5]

Figure 1. (FFP1)

https://upload.wikimedia.org/wikipedia/commons/thumb/d/dc/Cone-88240_1920.jpg/1200px-Cone-88240_1920.jpg

Figure 2. (N95)

https://multimedia.3m.com/mws/media/735026P/3mtm-particulate-respirator-8210-n95.jpg

Figure 3. (Cloth Mask)

https://i2.wp.com/stylemeetsstory.com/wp-content/uploads/2020/05/Pastel-Fashion-Magazine-Cover.png?fit=791%2C1024

Figure 4. (Copper Mask)

https://p.ipricegroup.com/764d5a58a5bd543910c99c5ac79067ec2e8bce54_0.jpg?position=2

Figure 5. (Surgical Mask)

https://image.freepik.com/free-vector/layered-standard-surgical-mask_23-2148593802.jpg

In Europe, respirators must comply with the EN 149:2001 European standard, which identifies three classes of disposable aerosols respirators. FFP1 utilizes to the minimum filtering of the three masks with at least 80% aerosol filtration and is primarily used as an industrial dust mask [6]. FFP2 respirators are roughly equal to N95 with 94% filtration, leaving them strongly advised in the US and several other counties for use in the reduction of airborne viral infections [7]. FFP3 mask is a part of PPE with a valve at the center that is designated to allow heat to pass and reduces eyewear fogging while wearing PPE. The Health and Safety Executive (HSE) has revealed that the FFP3 masks have a filter efficiency of about 99% and a gross inward leakage of about 2%; this entails a leak of the facial seal [8].

In addition, face mask had become a new normal clothing accessory. A number of styles, designs, and materials are being used and marketed to the extent that the industry of making and distributing face masks was developed such as cloth mask and Copper mask which are next from surgical mask to be the most profitable mask because it gives people satisfaction in fashion. Cloth mask can filter infectious aerosols as other mask but less than surgical mask, also the filtration performance of it depends upon numerous factors such as thread count, layer thickness, fabric type, and water resistance [9]. On the other hand, copper oxide have antiviral properties and biocidal component or ability to destroy bacteria therefore copper mask may reduce hand and environmental contamination [10].

Nonetheless, since respirators or cloth and copper mask may be in short supply during a pandemic or not accessible in several locations, it is essential to consider the efficacy of surgical masks' safety.

Surgical mask and N95 are generally for healthcare workers in times of pandemic, but surgical mask is more available and widely used in public than N95. Justifiably, surgical masks are often used as an infection primary intervention in East and Southeast Asia, and were recommended for healthy people in crowded public spaces by governments in China, Hong Kong, and Taiwan early in the pandemic, while masks were also prescribed for symptomatic people in Japan and Singapore[11] and besides, the former is recommended by Centers for Disease Control and Prevention

or CDC to be used as protective gear and also suggested on doubling the surgical mask whenever in use [12]. Also, surgical masks are less expensive because it is made with thin multi-layered non-woven bonded fabric. Three or four layers are made up of non-woven fabrics, which are inexpensive to produce and clean due to their disposable existence [13]. Ordinarily, commercial surgical face masks have a three-layer design. The middle layer is the filter media, while the inner layer (white part) is for moisture absorption and water is repelled by the outer layer (blue part) [14]. Surgical masks restrict a person's exposure to the patient's non potential and potentially infectious droplets [15] since transmission of fluid-borne may occur through splashes, it is use as fluid barrier which rationalizes the fact why surgeons and other hospital personnel prefer surgical mask especially when doing surgery because it blocks fluid and ready for disposal after use.

Contrary, Surgical masks have also limitations in terms of its filtration efficacy. Given that it only filters fluid, it may lack in filtering infectious aerosols. A study findings indicate that,

"Notably, the filtration efficiency of some of the consumer-grade masks, such as a washed 2-layer nylon mask with ear loops and an aluminum nose bridge (79.0%), exceeded that of a medical grade procedure mask with ear loops (38.5%), and a surgical mask with ties (71.5%)" [16].

As observed, surgical mask with ear loops and ties revealed the lowest percentage of filtration in aerosols. Lastly, according to the Food and Drugs Administration or FDA, surgical mask is not for long term use because it can only be use for once [17] and should be replace after 4 hours the most [18]. Mask can prevent infectious fluid but extended usage of a supposedly single-use mask may lead to catching an infection or bacteria due to lack of hygienic process.

Hygiene is the requirements or procedures directly related to health maintenance and disease prevention, necessarily through cleanliness. There are various category of hygiene: home hygiene, food hygiene, and personal hygiene. Home hygiene may simply indicate to household sanitation; food hygiene refers to the needs to be done and conditions to monitor hazards and ensure the safety of a food item for human use to its final use [19]; personal hygiene is a wide category which requires personal routine activities such as how to take a bath, wash hands, cut fingernails, change clothes regularly and etc. [20].

In emerging economies, the augmented threat of communicable diseases due to lack of proper personal hygiene practices and poor health conditions is still a problem on the public health agenda [21]. The growth rate in immune disorders and atopic diseases is caused by a fluctuation in the occurrence of infectious diseases over the same period, which can result to stronger vaccine and antibiotic therapy and improved sanitation standards [22], therefore promoting proper hygiene is essential because it is one of the most significant national disease preventive measures [23].

Hygiene and medical products are set to be agents in preventing diseases, a device called contactless surgical mask holder with automotive alcohol dispenser (CSMH-AAD) is a device built to promote preventive measures. According to DOH, Hong Kong and Philippines, the use of a face mask should be accompanied by frequent hand washing with soap and water, or an alcohol-based sanitizer [24][25]. The statement inspires the idea of formulating a device with 2 in 1 that contains two essential protective products (surgical mask and rubbing alcohol) that secures health. Instead of any other mask, surgical mask contains inexpensive materials making it disposable and more available in public. CSMH-AAD is appropriate in places such as hospitals, clinics, schools, malls and other over populated places. Spince surgical mask shouldn't be in extended use therefore, people may rely on this device to replace their masks.

3. STATEMENT OF THE PROBLEM

To testify the innovation, there are questions that should be met and answered throughout the research experiment. The following are queries that will be performing a findings of by the researchers:

1. What problems and issues being encountered by people in terms of using surgical mask?

2. What are the materials and processes in doing contactless surgical mask holder with an Automotive Alcohol Dispenser?

3. Does the contactless surgical mask holder can be measured in terms of:

3.1 Acceptability;

3.2 Durability, and;

3.3 Efficiency

4. What are the recommendation of the respondents regarding the face mask dispenser?

4. METHODOLOGY

In conducting the study, the researchers used an experimental type of research. It sticks exclusively with a scientific design and as cited by another study, an experimental approach is best when assessing the effect of an experiment within a well-respected field of interest [26]. The researchers experimented and innovated CSMH-AAD or the Contactless Surgical Mask Holder with an Automotive Alcohol Dispenser that primarily delivers sanitary satisfaction for all individuals. Under experimental research design is quasi-experimental research design that was also partially adopted in the study which aimed to test two groups:

experimental group and control group [27]. Experimental group consist of members that can make a rightful response in the field of building and/or repairing machines while in Control group are people who can be a target buyer or user of the product. The groups will basically be the witness and proof on the utility of CSMH-AAD. Moreover, hypothesis are also included. The researchers collected results which will either reject or support the hypothesis. In this study, it was hypothesize that CSMH-AAD may promote a better hygienic and safety experience to users.

For the sampling method, purposive sampling (also known as judgment, selective or subjective sampling) was enrolled or was carried out upon choosing respondents. This is a sampling technique in which researcher relies on the own judgment when choosing members of population to participate in the study. It is a type of non-probability sampling that researchers or experts in studies used effectively to probe deeper in knowledge and study a certain thing or cultural domain with knowledgeable participants included [28]. With regards to the research design, respondents and/or partakers were categorized into two groups; three with expertise (experimental group) and four without expertise (control group).

The tool used in order to collect data were research interview questions in which it is a process of conversation where the researcher is an interviewer while the respondents are the interviewees. There are seven individuals chosen to partake in the interview prior to the product - CSMH-AAD, however, it is necessary to get a thorough overview and analysis of all the collected data before concluding. This study make use of the Code and Theme analysis to process gathered data. Thematic Analysis is a form of questioning that is well-suited to learning about people's experiences and codes were created for easier understanding on undiscovered and important information [29]. The researchers reviewed and familiarize transcribed text from an interview and/or recordings about CSMH-AAD to encode and analyze the content of the data then proceeds in the results and discussion as well as in conclusion.

5. RESULTS AND DISCUSSION

I. Problems and issues being encountered by using Surgical Mask

There are no significant problems brought by using surgical mask that may endanger human health but minimal problems were accumulated and analyzed from the survey and these are: Shortness of breath or difficulty in breathing, skin irritation and discomfort, defective surgical mask, and gaps on its coverage.

A. Shortness of breath

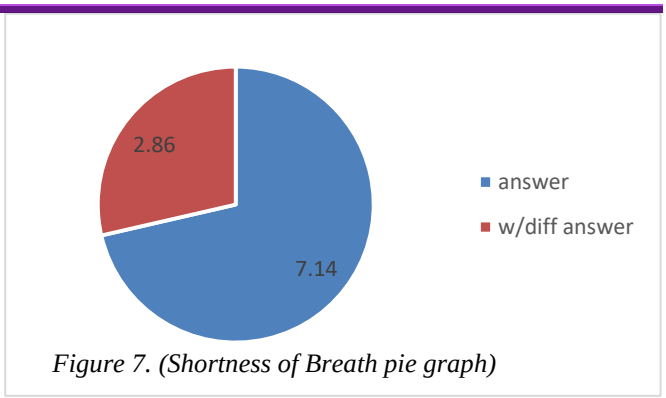


Figure 7. (Shortness of Breath pie graph)

There are 5 out of 7 (7.14%) respondents answered that shortness of breath is their primary problem in terms of using surgical mask especially when doing physical work since it is made to cover the airway responsible for respiration. Respondent 3 indicates that he is experiencing difficulty in breathing whenever performing cardiovascular workout outside such as cycling and jogging but he also clarified that aside from that, he doesn't have a problem at all when doing natural activities. Similarly to the idea of former interviewee, Respondent 5 encountered the same difficulty but during cargo or strength-related works and except from that, everything are handy. However, Respondents 2, 6 and 7 find it hard to breathe while wearing surgical mask even while performing natural activities. Those who are experiencing the phenomenon may have a sensitivity to humid air or dry air, increased heart rate especially when engaging with physical activity, not used to having mouth and nose covered that results in resistance to airflow since face masks were made to resist airborne viruses [30].

B. Skin Irritation and Discomfort

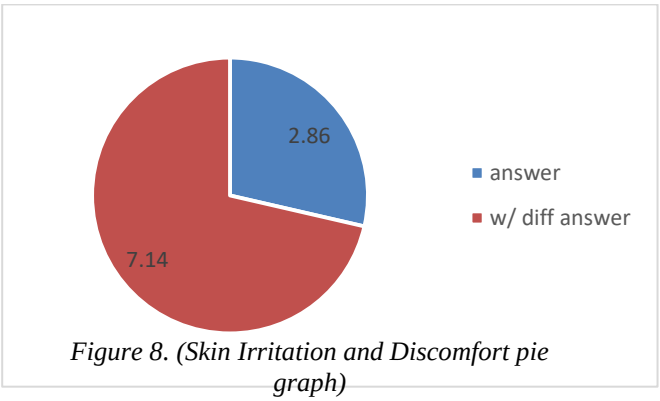


Figure 8. (Skin Irritation and Discomfort pie graph)

Among the 7 respondents, 2 of them denoted skin irritation and discomfort such as pimple breakout around perioral area or around the surface covered by mask as per respondent 5 and itchiness as per respondent 7. The causes of shortness of breath whenever wearing a surgical mask was revealed formerly and in connection to one of the mentioned causes, itchiness and triggered pimples may also on account of subjective humidity given that mouth, nose and cheek are

responsible for thermal release but was hindered by surgical mask that conceals those areas and therefore builds up facial heat thus increases skin temperature proportionally to heart rate then moist and sweating of perioral area started to occur. This is called, thermal discomfort [31].

C. Manufacturing Defects and Mask Durability

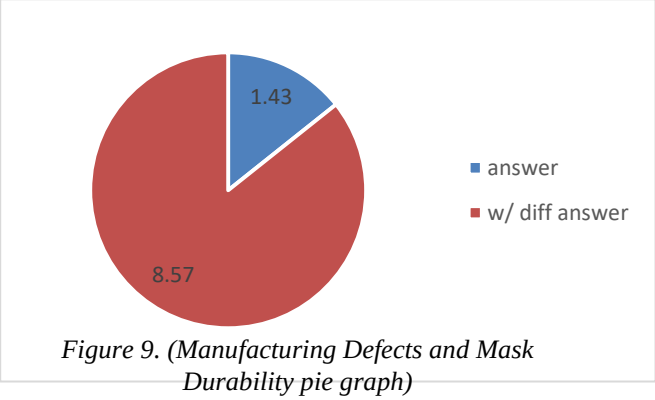


Figure 9. (Manufacturing Defects and Mask Durability pie graph)

On the testimony of respondent 2, one of her common issue against surgical mask is its elastic bands durability and the inconsistent fabric thickness. There were several times that the masks' elastic bands wear off or de-attached easily to the mask itself, making her replace the mask. She also observed the inconsistency of fabric thickness because at times, the layers of filter fabric are thin.

D. Coverage Capacity

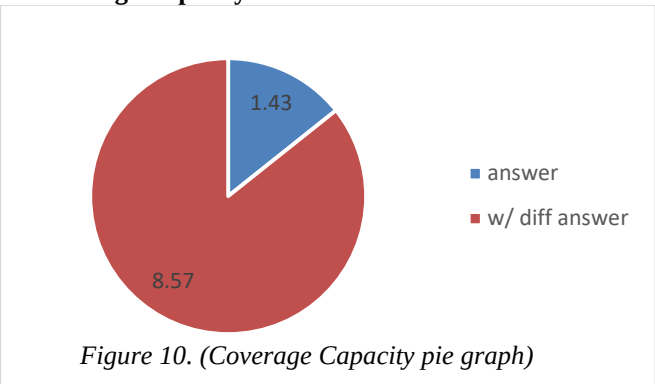


Figure 10. (Coverage Capacity pie graph)

As specified by respondent 1, surgical mask doesn't secure its coverage because of the gaps and little spaces around nose specifically near palpebral portion and cheeks. But the respective areas (perioral area) to cover is quite secured

II. Materials, Processes and Design of CSMH-AAD

A. Materials

- Side polycarbonate plastic panels cut into (4) 13.5 x 10-inch
- (3) 10 x 10-inch internal polycarbonate plastic panels
- Velcro
- Glue stick, glue gun
- Illustration board
- Coiled spring
- DC Motor
- Plastic container for alcohol
- Water pump
- Plastic tube
- Surgical masks
- Alcohol
- Arduino UNO board
- Jumper wires (male to male, female to female)
- Relay module
- 2x IR proximity sensor
- LCD (Liquid Crystal Display)

B. Steps and Processes

1. Cut a 6.1-inch mark for the backside panel while for the sides of a container with a size of 13.5 length x 10-inch width, cut each side of the four different plastic panels.

2. For the front plastic panel, 6.1 inches from it cut a rectangle having a size of 6-inch length and 4-inch width. After that you may now continue from 3 inches below, cut two small holes on top of each other. Cut a small hole on the top-left corner of the front polycarbonate panel.

3. In continuing this step by step process, a rectangular hole with a size of 8cm in length and 3 cm in width must be cut on the left side of the plastic panel, a 5cm from the top and 8 cm from the back.

4. Now with a size of 10 by 10 inch cut three to be use as internal panels.

5. To form a container attach the side panels side by side using a glue gun and/or glue stick. First, stick an internal panel below as its own floor. Second, for its roof glue one side of another internal panel similarly with a trapdoor and last, use Velcro to mimic a door for the backside plastic panel. Following these three sequencing will make the alcohol container refilling process much convenient.

6. Create a box for masks with no roof using an illustration board then create a hole from the back wall to put through the motor shaft. After putting, connect a coiled spring, a minute after cut a large hole on the other end of the coiled spring so the masks could drop on it. As for the box stick it at the top of the container creating a vast space for the dropping process of the masks.

7. To prevent wires from mingling with the drop area, create a divider with an illustration board around the drop area.

8. Cut a small hole 6 by 6 cm on the center of the third inside panel. In the 6.1-inch mark of the front plastic panel, stick the third internal panel horizontally to create an internal flooring.

9. Create two small holes on the cap of the alcohol container large enough for a plastic tube and the wire of a water pump to pass through.

10. On the container place the water pump inside and its wire outside through the small holes. Then to direct it to the one of the holes on the front side of the plastic panel you must connect a small plastic tube to the water pump.

11. Place a sensor on the rectangular hole on the left side of the plastic panel then place the second sensor on the front side of plastic panel below the hole where the plastic tube is located.

12. Place the circuit board on the internal panel, connect it with the motor sticking on the outside of the mask box and the water pump on the alcohol container with soldering iron through the small hole made on the internal panel. Connect the LCD to the circuit board.

13. To prevent masks from dropping at once fill each mask box with surgical masks placed alternately on the coiled string and lastly, for the alcohol container, fill it sufficiently with a half level.

C. Design

CSMH-AAD was designed to be present in hospitals, clinics, supermarkets, shops, stores and other overpopulated areas where contraction of diseases is more susceptible. Although the practice of wearing masks in public is essential, CSMH-AAD assures safety, both psychologically and physically, as it shows that hygiene is of utmost priority.

In choosing the outer structure material of CSMH-AAD, materials were assessed based on their cost and quality. While aiming for ease of refilling the contents of the products while maintaining its durability and cost-effectiveness, two materials were subject to the researchers' appraisal: polycarbonate and acrylic. In terms of strength, polycarbonate exceeds that of acrylic as the latter cracks more easily under stress due to its extreme rigidity. The transparency of the two materials does not matter but the researchers preferred an opaque option to hide the circuit board and wires within CSMH-AAD. As a result, the researchers settled for a polycarbonate material.

In forming the structure of CSMH-AAD, the researchers considered the accessibility where masks and alcohol were refilled without destruction of the product and with minimal maneuvering between the inner structures. The CSMH-AAD was divided into two sections: the top for the mask holder and bottom for the alcohol dispenser. The roof of the product, accessed from the back, will allow the manager's product to easily fill the coil alternatively with masks and the side containers to hold extras. Meanwhile, to access the alcohol dispenser, the back panel is cut into two by the 6.1-inch mark (refer to STEPS AND PROCESSES under II.B Materials and Processes in doing CSMH-AAD). This mimics a small door-like contraption that can be opened from the back, allowing the manager's product to refill the alcohol container with minimal maneuvering and no damage of inner structures.

To guarantee that CSMH-AAD is maximized in its efficiency with sensors, a small box with one side open to the front and a sensor under the tube is added with intervals. To prevent the sensor's detection of unwanted movement, triggering the mask holder mechanism inside, the researchers added a box large enough to surround the tip of a hand. This will prevent unwanted detection from the outside environment except for the presence of a hand. For the alcohol dispenser, the hole of the tube is superior to the sensor. When the sensor detects a presence of a hand, it will send a signal back to the circuit board. As a result, alcohol will get pumped into the tube, into the hand of a consumer. To prevent uncontrolled drips, CSMH-AAD is programmed with a 1-second interval.

In finalizing CSMH-AAD, an LCD (Liquid-Crystal Display) was added to assure consumers that their hand was detected. When the sensor in the mask holder detects movement, "Dispensing Facemask..." appears on the LCD. When the sensor in the alcohol dispenser detects movement, "Dispensing Alcohol..." appears on the LCD

Figure 11. (Internal and external structure of CSMH AAD)

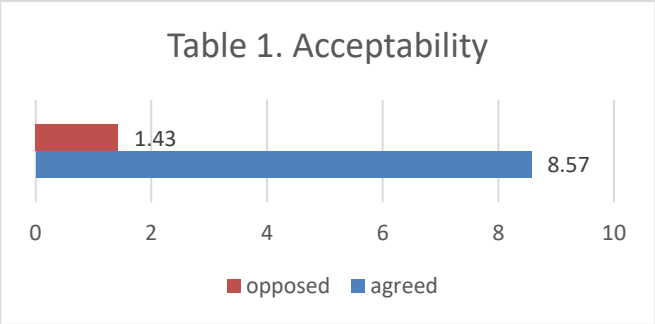
International Journal of Academic Multidisciplinary Research (IJAMR)
ISSN: 2643-9670
Vol. 5 Issue 4, April - 2021, Pages: 267-276

III. Acceptability, Durability and Efficiency

The CSMH-AAD's acceptability, durability and efficiency was measured in accordance with the answers and opinion of the respondents. In addition, pictures and a video on how to use the device were sent to them as basis for the structure, utility and design of the product.

Video on how to use CSMH-ADD:
https://drive.google.com/file/d/1RZR4DDRLX1iGAutocw4X_iY34T0oFLj9/view?usp=sharing

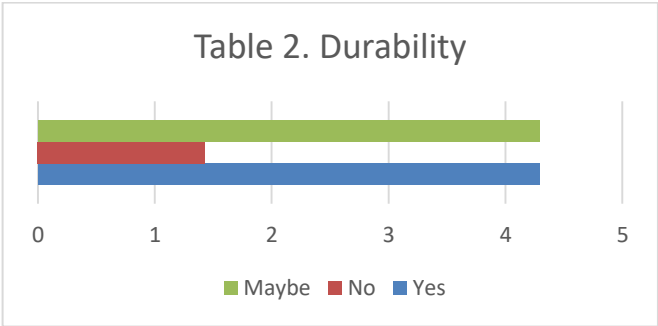
3.1 Acceptability



Interviewees were asked if the product would be acceptable to the market and six of them agreed, however one disagreed. Most of the answers were about the usefulness and benefit of CSMH-AAD to both people and economy. Respondents 1, 2 and 7 agreed that it'll be useful for people to avoid physical contact from mask sellers or vendors and to those people in supermarket or nearby landmarks that sprays alcohol thus, its utility is in line with the health protocols against virus. Respondent 2 also added that the product can be placed behind the entrance of markets, shops, stores and etc.; as believed by respondent 3, the product is untroublesome or convenient to use considering the fact that it is automated and aside from that, CSMH-AAD is another invention to the body of science and technology. Furthermore, he also said that, it may be distributed in communities once undergone and approved by FDA's Medical Device Development Tools (MDDT). He also theorize that if the price of the device, once sold in public, is based on consumer's interest, it would be even more accepted to the market; respondents 4 and 6 noticed the mask used in CSMH-AAD which according to their knowledge, assures protection against viruses and safer than cloth mask.

Contrarily, respondent 5 highly doubted its acceptability to the market but find it efficient. He argued that Filipinos often buy a box of surgical mask or have it individually before going out making them unneeded for a supply. He also perceived that, there is a high probability of being infected by the virus once arrived in an overpopulated places since surgical masks have its own limitations.

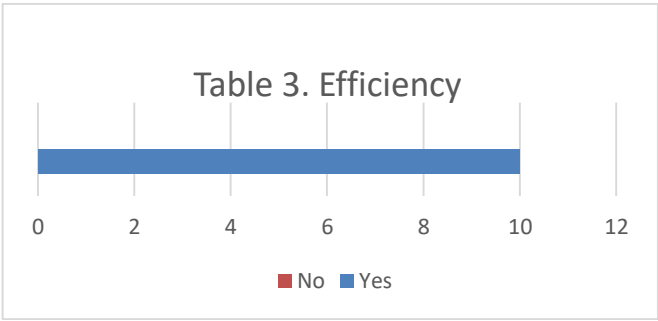
3.2 Durability



In accord with the judgments of the respondents, three of them confirmed the product as durable enough (respondents 1, 5 & 6), three answered "maybe" and the reasons were: a.) for respondent 2, it'll be safer if a professional examines it to address flaws and proper materials in replace to make it more durable, (b) respondent 3 said that he is unknowledgeable of the materials being used therefore it's hard for him to assess the durability of CSMH-AAD, and (c) respondent 7 stated that in order for it to be more durable it's better if a plastic fiber, metal or aluminum sheet was applied instead of polycarbonate panels.

On the contrary, respondent 4 answered "no" to the product's durability because professionally, it should be tested and examined firsthand.

3.3 Efficiency



When it comes to efficiency, the rate of agreeableness is 100%, meaning all of them supposed CSMH-AAD as in great help to people and community's well-being and safety. Individually, respondents 1 & 4 indicated that the product could help promote hygienic lifestyle especially during pandemic; respondents 2, 3 & 7 are certain that citizens were in immediate need of alcohol and facemask as COVID-19 continue to spread and the product may assure the safety and worrisome of the user

against viruses because it prevents physical contact since CSMH-AAD is a medical device with automatic alcohol and mask dispenser; for respondent 5, he commended its small-handy structural design and take noted of the two essential needs during pandemic, which are alcohol and facemask that made it efficient; and lastly for respondent 6, she emphasizes its ability to keep masks disinfected because of attached contactless alcohol dispenser along with automated mask dispenser.

IV. Respondent's recommendations to Improve CSMH-AAD

According to the accumulated frank answers of respondents, there were four professed recommendations. Respondent 1 suggested to label the product with as cheap as possible price to the market because he assumed that people need such device the most during pandemic (1); respondents 2 & 7 proposed implying metal casing and more concrete materials to make it undoubtedly durable (2). Respondent 7 also advised to use a more presentable dispenser. Connectedly, respondents 4, 5, & 6 recommended advancing the design to make it more enticing (3). Last of all, respondent 3 suggested for the product to be tested and enlist all problems encountered or met and therefore will serve as guidance to improve the device (4).

6. CONCLUSIONS

CSMH-AAD is made to promote hygienic lifestyle as the device was structured with automotive alcohol and mask dispenser. In favor with the current type of virus spreading, surgical mask is the most appropriate in all ages and it was deliberately and undergone many researches to prove its function as protection from COVID-19 (a communicable disease). However, there are still issues confronted when using surgical mask. It was discovered that some users encounter Shortness of Breath because of the resistivity to airflow, Skin Irritation and Discomfort due to subjective humidity that causes in increase facial heat and then develops sweating and moist around the area covered by the mask, Manufacturing Defects such as the attachment of elastic bands breaks instantly and under defects are inconsistent fabric thickness that at times thin layers beyond normal is sold to the market. Lastly, there are gaps and little spaces present while wearing the mask.

It was concluded that the device will potentially be accepted in the market because the advanced utility of the device secures hygiene and us proven to be purposely efficient on promoting safety (health protocols), hygienic lifestyle, and it provides two subjective needs of a community during pandemic. However, CSMH-AAD's durability shall be further improve and tested before passing the consumer's standards on its ability to withstand long-lasting.

Even though the device had been successfully constructed and executed its distinct function, recommendations to improve the device is still asked with the likelihood of the authors to provide consumers the best experience. Advises from respondents under experimental (with engineering background) and control group (target consumers) were analyzed. Such recommendations are: (1) offer CSMH-AAD with as cheap as possible cost in the market, (2) rely on more durable materials, (3) upgrade the design of the product to make it more appealing, and (4) have it examined by a professional.

7. RECOMMENDATIONS

Based on the conclusion and researches, the following are hereby recommended:

1. State more proof and elaborate why CSMH-AAD should be accepted to the market.

2. Examine, observe and cite what materials are needed to be replaced in order to secure its durability.

3. Sketch and construct designs of the device that will make it appear handier and can be attached to any transportation vehicles yet still has the high functionality as the original design.

4, Upgrade the utility and components of the container – may add thermal scanner to make it exceptional and 3 in 1.

5. Improve surgical mask holder and make it hold multiple amount of masks that could last for days.

6. It could be keycard based instead of censored based CSMH-AAD wherein the user will buy a keycard which enables her to have an access with a designated amount of times or a time interval before she can access it again to prevent exploitation on using the device and in order to keep mask and alcohol in stock incessantly.

8. ACKNOWLEDGEMENT

We are so glad for each and everyone's participation in this study, we would like to give credit and acknowledgement for those individuals who helped us all throughout in the study, let's start with our truthful and reliable participants who gave their valid responses that greatly enhanced and made our study substantially definitive and also a felicitation remark to the father of one of our dependable researcher, Mr. Isidro who guided us for the planning, preparation and process of our Contactless surgical mask holder with an automotive alcohol dispenser. Lastly, is for our research master, Mr. Chris who educated and instructed all of us which greatly developed our skills and made our capabilities wider thus, made our research study salient during this time of pandemic. We hope that the study may contribute to the

knowledge of other researchers and to the body of science & technology for the reason that the device was inspired on fighting against corona virus and preventing its contagious genetic materials to infect one another.

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