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# Simple procedure for preparation of triple-layered homemade mask as preventive measure for SARS-CoV-2 infection

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**Abstract**
The current study was performed to prepare three-layered homemade mask by simple procedure with the help of easily available raw materials at home in minimum duration without any major equipment like stitching machine. The masks are useful to protect us against SARS-CoV-2 and other respiratory pathogens according to recent issued guidelines by Centre for Disease Control and Prevention. The homemade mask were prepared by commonly available materials at home and easily prepared by using the simple procedure, which was described step-by-step in the current study. The simple procedure was consisting only seven steps that were described in text and practical aspect, also. Finally, evaluation of the cost and duration of one mask was also done. Results of the study revealed that the mask can easily and successfully prepared to follow the seven steps of the simple procedure, which was performed and shown theoretically and practically in the study. It was also found that the mask was prepared only in average duration i.e. 21 minutes with any cost if raw materials were available at home. In addition, cost of mask per piece was also calculated only rupees 6.75/- per piece after purchasing the consumable material from market. Further the cost of the mask was compared and found cheaper than the others. Three-layered homemade mask is better option to cover face, which can provide us prevention measures from SARS-CoV-2 infection. In current situation, there is huge demand of the mask due to the emerging and highly contagious viral COVID-19. Therefore the study provides an option to prepare the three-layered homemade mask by this simple procedure at your place and use it many times after washing and disinfecting properly.

**Keywords:** homemade mask, triple-layered, simple procedure, preventive measure, cost-effective, SARS-CoV-2 infection

## Introduction
The International Committee of Taxonomy of Viruses (ICTV) has established standard format to facilitate good practice and exchange about the scientific knowledge and first of all, they provided a name to know about the novel virus; Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Recently, SARS-CoV-2 is considered as emerging viral pathogen and it causes a serious & potentially life-threatening viral infection called as Coronavirus disease (COVID-19). The COVID-19 is an acute respiratory disease and the World Health Organization (WHO) characterized COVID-19 as a pandemic disease on 11th March 2020 [1], which originated from Wuhan in China [2]. Recent reports also provided data of positive cases for COVID-19 with their characteristics among the Indian population [3]. It can be transmitted human-to-human through potentially droplets containing the viral pathogen; it can enter through three common routes eyes, nose and mouth of another human host after contact with these droplets. Currently, there are no FDA approved vaccines and treatments available for COVID-19 [4, 5]. Prevention measures are only optioning to protect and save you from the SARS-CoV-2. Therefore, the consumption of the mask is high and also the availability of the mask is very limited due to lockdown in India. National and international health agencies recommended different preventive measures for public health concerns like social distancing, wearing masks, maintain hygiene etc [6, 7, 8, 9]. On 04th April 2020 at 12:22 PM, CDC published a document where it suggested that wearing face-covering and maintains distance at least one-meter distance in between two persons in public places such as Grocery, Market, Medical store, Diary boots etc [7, 9]. After undertaken of this account, the authors tried to prepare a three layered homemade mask by simple procedure as preventive measures that will provide us protection from COVID-19 and also provide a proper way to disposal of the used mask. The current study with the aim performed to describe a simple stitching technique to prepare a safe three-layered mask with available used cloth at home with any major equipment and will help to give protection against various contagious respiratory infections including COVID-19, as emerging and potentially life-threatening viral infection globally.

## Materials and Methods
**Raw Materials:** One person was required to perform the task, which has acquainted with minimum measurement, cutting and stitching skills. The following raw materials with the purpose were used to prepare the three layers homemade mask.

1. Cloth was selected based on its tightly woven and soft felling new or old cotton cloth like
2. quilting fabric, cotton sheet. The cloth was washed with commonly used detergent at home and then disinfect with available disinfect such as Dettol, Savlon, Alcohol (70%), etc.
3. Inch tape was used to measure rectangular shape and size or 15X25 cm) of the cloth, as per the CDC standard specifications (6X10 inches) [7].
4. Pencil was used to mark the measurement on the cloth.
5. Stainless steel scissor was used to cut the cloth in pieces

(03 numbers for one mask).
6. Stainless steel needle and white one-color reel thread was used for the stitching purpose.
7. Elastic (½ cm wide) was used to make ear loops for both sides.

**Procedure:** The three-layered homemade mask was prepared as per the described method of CDC [7] with the minor modifications. In brief, the following steps were adopted to prepare simple and protective triple-layered homemade mask to protect from COVID-19.

Step I: Take a woven and soft felling new or old cotton cloth and measure length 16 cm and
width 26 cm size in rectangular shapes with the help of inch tape, then mark it by pencil.

Step II: Cut the marked area of the cloth and total three equal size pieces of 16 cm length & 26
cm width with the help of the scissor and stack the three rectangles pieces.

Step III: Fold ½ cm individually of all four sides of the mask and then stitch by hand with the
help of thread in needle manually.

Step IV: Two pieces of the elastic used to connect both corners of the left side and another, both
corners of the right side, respectively. Gather the sides of the mask covering on the elastic and primary checking of the homemade mask covering fits on your face in a mirror.

Step V: Then securely stitch manually the elastic in place to keep it with the help of thread in
needle and you see two ear loops ready to hold the mask on your face.

Step VI: Final checking to see your face in the mirror for fitting and covering of the three layered
homemade mask on your face and measure the actual size of the prepared rectangular shape mask approximately 15 cm in length & 25 cm in width.

Step VII: Fold the mask four times to keep it easily in your bag or pocket.

**Disposal Procedure of the Mask**: The homemade mask was disposed after certain used, torn off damaged and stained conditions. These masks were disposed in to two steps:

Step I: These masks were cut in to two pieces.

Step II: Then disinfect the masks properly with recommended concentration of disinfectant by
manufacturer such as Dettol, Savlon, Alcohol (70%), etc.

**Evaluation of the cost and duration:** Step wise procedure of homemade mask was described sequentially and the duration & cost were also calculated accordingly. Finally, the cost of a homemade mask was calculated and compared with each other's.

## Results and Discussion

WHO has already developed guidelines and it is easily accessible for the general public on the website as guidance for home care and health care settings on infection prevention and control (IPC) strategies for use of surgical mask and its management for SARS-CoV-2 infected & suspected patients [10, 11, 6]. Recently, CDC advises & encourage the use of simple cloth face coverings as a barrier for the virus transmission from infected person (symptomatic and/or Asymptomatic) to healthy another. Cloth face coverings prepared by using household items or made at home from common materials at low cost can be used as an additional, voluntary public health measure [7]. In the current scenario, every person needs a mask to protect him, but the availability of the mask is limited due to various reasons such as lockdown, its production, and supply shortage. In this situation, a homemade mask is the best option, so any person can prepare their mask at home with the help of available materials cloth, inch tape, pencil, scissor, elastic, needle, & thread reel through this simple procedure as described step-by-step in Figure 1.

The homemade mask is simply flat, comfortable, easy to wear, less time consuming and cost-effective. Besides, there are two major benefits to prepare own homemade mask; you prepare yourself with appropriate size and color when you need it and don't need to go outside for the purchase only. Every person can prepare the mask with follow these simple procedural steps. The mask was taken average time 21 minutes and it has no cost if required materials available at home otherwise its incurred cost is also lower than the market mask as given data in Table 1.

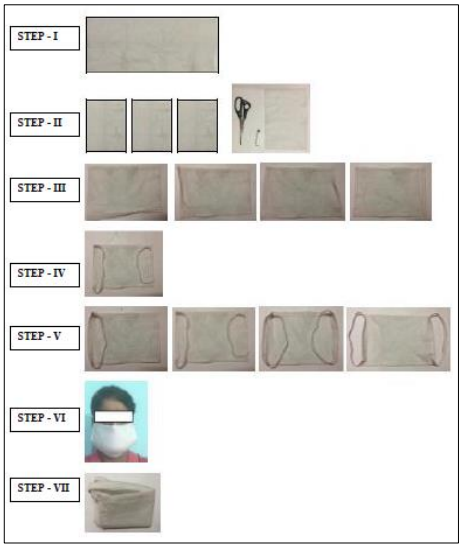


**Fig 1:** Step-by-Step practical procedure of the triple-layered homemade mask

Cost of the homemade mask was calculated for the 08 pieces only because the quantity was prepared by one meter of the cloth. Therefore, the cost was depended based on consumable, non-consumable, and both types of the items and cost of the eight pieces calculated and summarized in Table 2 and the cost comparison was done for one piece of the mask and the detail is given in Table 3.

| S. No. | Procedure | Duration | Cost incurred (in Indian rupees) | | |
|---|---|---|---|---|---|
| | | | Required material | Available at home | Purchase from market |
| 1 | I | 03 to 04 | Cloth☼ | Yes | 20 to 30 per meter© |
| | | | Inch tape | Yes | 20 to 30 per piece |
| | | | Pencil☼ | Yes | 02 to 04 per piece |
| 2 | II | 02 to 03 | Scissor | Yes | 50 to 55 per piece |
| 3 | III | 06 to 08 | Needle☼ | Yes | 02 to 03 per piece |
| | | | Reel☼ | Yes | 04 to 05 per piece |
| 4 | IV | 02 to 03 | Elastic☼ | Yes | 18 to 20 per meter |
| | | | Mirror | Yes | 30 to 40 per piece |
| 5 | V | 03 to 04 | Needle☼ | Yes | Already included |
| | | | Reel☼ | Yes | Already included |
| 6 | VI | 01 to 02 | Mirror | Yes | Already included |
| 7 | VII | 01 | By hand | Yes | Not applicable |
| Total | 07 Steps | 17 to 25 (Mean-21 min) | 08 nos. | YES | 146 to 187 (Mean-166.5/-) |

Note: ☼ - Marked as consumable materials.
© - 08 pieces were made from 01m² cloth.

**Fig 1:** Step-wise procedure, raw materials and cost

| S. No. | Material | costing with (in Indian rupees) | | |
|---|---|---|---|---|
| | | Consumable | Non- Consumable | Both |
| 1 | Cloth | 25 | 00 | 25 |
| 2 | Pencil | 03 | 00 | 03 |
| 3 | Needle | 2.50 | 00 | 2.50 |
| 4 | Elastic | 19 | 00 | 19 |
| 5 | Reel | 4.50 | 00 | 4.50 |
| 6 | Inch tape I | 00 | 25 | 25 |
| 7 | Scissor | 00 | 52.50 | 52.50 |
| 8 | Mirror | 00 | 35 | 335 |
| | Total | 54 | 112.50 | 166.50 |

**Fig 2:** Cost-effectiveness of the mask (08 pieces/01m$^2$ cloth)

Final calculation of the mask was done only based on consumable items because other items did not consume in the eight pieces and these items have a long-life span. A total of six rupees and seventy-five paisa (Rs. 6.75 per piece) was meeting the cost of one homemade mask as shown in Table 3 and it is reusable after washing & disinfect, so it is cheaper than the purchased mask ready to use with single-use from the market.

| Cost of number of piece | Cost incurred (in Indian rupees) | | | | |
|---|---|---|---|---|---|
| | Ready to use (Disposal) | Homemade | | | |
| | | Consumable | Non-Consumable | Both | Available at Home |
| 08 | 96 | 54 | 112.50 | 166.50 | 00 |
| 01 | 12 | 6.75 | 14.06 | 20.81 | 00 |

**Fig 3:** Cost comparison of the mask price

The triple-layered homemade mask is used by human being as a preventive measure for protection of SARS-CoV-2 and other respiratory infections. Therefore, disposal of the triple-layered homemade mask has main concern because it was used to provide protection from contagious diseases such as COVID-19. In this case we need simple, easy, effective method for disposal of the masks after certain used, torn off damaged and stained conditions. These masks were disposed in to two steps as suggested by guidelines of authorized agencies: first cut the mask in to two pieces and, then disinfect properly with recommended concentration of disinfectant, for example Dettol, Savlon, Alcohol (70%), etc. Despite this, you can prepare your homemade mask with choice of color, sizes, and shapes to protect yourself from COVID-19 as well as other respiratory diseases. It can also protect from dust in routine life when you go outside to visit any public places such as markets, offices, shopping malls, airports, bus stations, railway stations, and other places. As per my opinion, it has numerous benefits and minimum requirements as described & categorized separately.

## Benefits

1. You can easily prepare many masks anytime on your own, even in the lockdown period and during the shortage condition of mask in the market.
2. The mask gives you protection and safety from dust particles, microbes, droplets containing COVID-19 and other respiratory syndromes.
3. The mask is reusable because it is washable and disinfects the number of times easily.
4. It has no cost if you used materials available at home.
5. It provides us independency.
6. Most important thing is that no need to go outside from your home. In this way, you can maintain social distancing.
7. Its disposal is easy when it will damage or not in use.
8. There is no need for any major equipment to prepare it like a stitching machine.

## Minimum requirements

1. It is a laborious job because the preparation of the mask has taken average time 21 minutes.
2. It requires self-motivation with minimum stitching skill.

## Conclusion

World Health Organization declared that Coronavirus disease (COVID-19) is a highly contagious pandemic disease worldwide and pathogenic viral infection caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), which emerged first in Wuhan, China at the end of 2019. It is suggested that the route of human-to-human transmission of SARS-CoV-2 is either via respiratory droplets or contact. It can enter through three common entry routes eyes, nose and mouth of another human being after coming in close contact of the potentially infective respiratory droplets. Wearing a medical mask is one of the prevention measures to limit the spread of certain respiratory diseases including Coronavirus disease. As CDC recommends wearing face mask covering in public places where social distancing is difficult to maintain especially in the area of significant community-based transmission in the first week of April 2020. On the basis available literature, it is well established that simple cloth mask can use as preventive measures to protect persons from COVID-19 and other respiratory diseases also, which are transmitted through contact and droplets containing disease-causing microbial pathogens and the mask should be disposed only after disinfect properly. In this direction, the current study performed to aware the general public that they can prepare their own the three-layered mask at home by applying the simple procedure without any special need of equipment & raw materials and prevent themselves against current pandemic COVID-19, caused by emerging SARS-CoV-2 viral pathogen. Apart from this, it has numerous benefits and minimum requirements as already discussed in the result & discussion section of the article.

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Due to pandemic infection of SARC-CoV-2, current scenario motivates the authors to conduct and publish the study for good health of human being.

**Authors Contributions:** All the authors have contributed equally.

**Conflict of Interest:** The authors report no conflicts of interest.

## Abbreviations

COVID-19: Coronavirus disease
SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2
CDC: Centre for Disease Control and Prevention
Cm: Centimeter
m: Meter

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