

Innovative research initiatives for COVID-19

TOPIC: DEVELOPMENT OF INDIAN REUSABLE FACE SHIELD FOR PERSONAL PROTECTION AGAINST COVID -19.

AIM: The aim at this project is to develop an innovative face shield by available material with minimum cost, so that it can reach to maximum number of potential users during Covid-19. This will also provide an aid to health care professionals as well as sociality and nation by easy and fast availability of face shield option.

INTRODUCTION: The novel coronavirus (COVID-19) had affected most of the countries worldwide [1]. The total 182,151 death has been reported because of it on to April 22, 2020, 18:26 GMT [2]. Initially the covid-19 has spread from a seafood based market at Wuhan in China. As this is contagious and transmittable viral infection. Yet all the countries are working hard to find vaccination, but none of them got any effective remedy to cure it.

The personal protective equipment (PPE) used to protect the person against environmental and other surrounding conditions. In common practice the face of healthcare workers directly come in contact with contamination and infection due to working all around in severe conditions. A face shield is one of the important personal protective equipment. It provides a barrier between facial area (lips, eyes and nose) and outside infecting agents. It offers the respective advantages.

- Easy and comfortable to use
- Able to protect complete face
- Clear vision.
- Create minimum claustrophobic effects.
- No change in breathing condition
- One size can fit for everyone
- Easily disinfected
- Cost effective
- No impact on vocalization
- Compatible with other PPE
- No major impact on verbal or nonverbal communication
- Doesn't cause anxiety in patient
- The life of protective face mask can be increased, if combined together.

The face shield also offers some limitations along with numerous advantages.

- Sometime dazzling light

- Mistful
- Optical imperfection
- Heavier in terms of weight with respect to other safety glasses.
- Poor fitting with respect to facemasks.

The face shield is normally used by laboratory workers, healthcare personnel, veterinary care staff, and different persons dealing with contaminated environment [3]. In 1903 by Ellen Dempsey of Albany from New York, got patent for a face shield to protect against germs, which causes inhaling disease [4]. A patent has been granted to James H. Bolker in 1974 for a transparent, faceplate made up of plastic [5]. A patent had been approved of non medical workers a cap based to face shield is structured in 1989 [6]. The standard 1910.1-030 with respect to Occupational Safety and Health Administration's (OSHA) related to blood borne microorganism [7] and other infection with airborne disease like Avian Influenza, Severe Acute Respiratory Syndrome [SARS], etc. It increased attention on face and eye protection due to intense infection because of the potential exposure of body fluid (e.g., Ebola virus, Covid-19). The above shown benefits and limitation of face shields are respective to other types of protective equipment for face and eye like safety glasses, goggles, facemasks or surgical masks etc [8-15].

The appropriate utilization of particular PPE for effective control of infection the review of the use of face shields is elaborated on here.

A team in MIT has introduced a disposable face shield while going through testing for different materials. The polyethylene terephthalate glycol (PETG) and polycarbonate materials are found to be most appropriate with respect to others. The actual problem with choice of material is not only depending on quality but availability too. The project leader Professor Martin Culpepper has given priority to the availability of material instead of other technical aspects. The other important point they kept in mind about its cost effectiveness and fast supply to meet present requirement [16].

A project to develop a face shield for hospital staffs during corona virus has been worked by American Architects like KPF, Handel and BIG Architects. It consists an effective design combined with a shield made up of clear plastic to cover facial area and a band of forehead [17].

The Mahindra Group along with others is making a face shield to provide protection for medical working person in Mahindra Kandivali Plant [18].

The Comparative analysis of available face shields for protection against COVID-19 in online Indian market is detailed in Table. I.

Table. I

S. No.	1	2	3	4
Name of face shield	Youngman Face Shield [19]	MICRO Plastic FACE SHIELD, For Pharma Industry [20]	Face Shield, For Safety Purpose, Visor Thickness: 2.5mm (SafeNet) [20]	Disposable Face Shields, For Safety Purpose [20]

Material(Visor): OHP Sheet	OHP Sheet	Plastic	PP	Transparent APET plastic
Material(Headband)	Polypropylene	--	--	Adjustable woven elastic
Price	Rs. 106.20/ Piece	Rs 38/ Piece	Rs 335/Piece	Rs 51/ Piece

GOALS:

1. To design the innovative Indian reusable face shield for medical professionals.
2. It should be easy and comfortable to use.
3. It should be designed by available material with minimum cost.
4. Work should complete with 15-20 day time.

BUDGET: 1500 Rs (If institute permit, then I would like to offer from my side for this noble cause)

DURATION: 15-20 Days.

REFERENCES:

1. Muhammad Adnan Shereen , Suliman Khan , Abeer Kazmi , Nadia Bashir , Rabeea Siddique :COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses, Journal of Advanced Research: 24, 91–98 (2020).
2. Covid-19 Coronavirus Pandemic Available at <https://www.worldometers.info/coronavirus/>.
3. International Safety Equipment Association (ISEA) : “Draft ISEA 119: Standard for eye and Face Protection against Biological Hazards.” Available at https://safetysiteequipment.org/userfiles/File/Background_statement.pdf (accessed July 14, 2015).
4. U.S. Patent Office : “Ellen Dempsey. Patent 737, 591. Sanitary Face Shield. 1903. ” Available at <http://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US737591.pdf> (accessed July 14, 2015).
5. U.S. Patent Office : “James H. Bolker Patent 3,943,575. Comfortable Surgical Hood. 1976. ” Available at <https://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US3943575.pdf> (accessed July 14, 2015). [Google Scholar]
6. U.S. Patent Office : “Darryl Dial, John M Geesbreght. Patent 4,805,639. Medical Cap with Face Shield. 1989. ” Available at <http://docs.google.com/viewer?url=patentimages.storage.googleapis.com/pdfs/US4805639.pdf> (accessed July 14, 2015). [Google Scholar]
7. Occupational Health and Safety Administration (OSHA) : “Blood Borne Pathogens Standard 1910.1030.” Available at https://www.osha.gov/pls/oshaweb/owadisp.show_document?p_table=STANDARDS&p_id=10051 (accessed July 14, 2015).
8. Farrier S.L., Farrier J.N., and Gilmour A.S.M.. : Eye safety in operative dentistry – A study in general dental practice. *Br. Dent. J.* 200:218–223 (2006).
9. Centers for Disease Control and Prevention (CDC) : “Workplace Safety & Health Topics. Eye Protection for Infection Control.” Available at <http://www.cdc.gov/niosh/topics/eye/eye-infectious.html> (accessed July 15, 2015).
10. Lindsley W.G., Noti J.D., Blachere F.M., Szalajda J.V., and Beezhold D.H.. : Efficacy of face shields against cough aerosol droplets from a cough simulator. *J. Occup. Environ. Hyg.* 11:509–518 (2014).

11. Christensen R.P., Robison R.A., Robinson D.F., Ploeger B.J., and Leavitt R.W.. : Efficiency of 42 brands of face masks and 2 face shields in preventing inhalation of airborne debris. *Gen. Dent.* 39:414–421 (1991).
12. Bentley C.D., Burkhart N.W., and Crawford J.J.. : Evaluating spatter and aerosol contamination during dental procedures. *J. Am. Dent. Assoc.* 125:579–584 (1994).
13. Perlino C., Hilliard J., and Koehler J.. : Fatal Cercopithecine herpesvirus 1 (B virus) infection following a mucocutaneous exposure and interim recommendations for worker protection. *Morbid. Mortal. Weekly Rev.* 47:1073–1076, 1083 (1998).
14. United States Air Force (USAF) Dental Evaluation & Consultation Service : “Personal Protective Equipment.” Available at <http://www.airforcemedicine.af.mil/shared/media/document/AFD-130329-130.pdf> (accessed on July 16, 2015).
15. Larsen E.L. and Liverman (eds.) C.T.: *Preventing Transmission of Pandemic Influenza and Other Viral Respiratory Diseases: Personal Protective Equipment for Healthcare Personnel: Update 2010.* Washington, DC: National Academies Press, 98–99 (2011).
16. MIT COVID-19 FACE SHIELD under project Manus at <https://project-manus.mit.edu/fs>
17. American architects mobilise to make coronavirus face shields for hospital workers at <https://www.dezeen.com/2020/03/29/american-architects-coronavirus-face-shields-hospital-workers/>
18. Mahindra Shields India: A Simple Innovation Protecting our Frontline Corona Warriors at <https://www.themachinemaker.com/innovation/face-shield-mahindra-ford-innovation-covid19>.
19. Youngman Face shield available at https://store.youngman.co.in/collections/featured-collection/products/youngman-face-shield?gclid=CjwKCAjw-YT1BRAFEiwAd2WRtiUbu-LZQFMHF7gAKar8LrvOJ_niKROs0_QXQPNBjiP8vycIO9DTfRoCMEUQAvD_BwE.
20. Indiamart faceshield available at <https://dir.indiamart.com/impcat/face-shields.html>.

Date

23/04/2020

SUBMITTED BY:

Dr. Manisha Sharma

Assistant Professor, EED

NIT Hamirpur