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TO ASSESS THE LEVEL OF OCULAR AND PERI-OCULAR DISCOMFORT IN HEALTH CARE WORKERS WHILE USING VARIOUS PROTECTION STRATEGIES (GOGGLES, FACE SHIELDS AND FACE MASKS) DURING CARE OF COVID-19 PATIENTS

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ABSTRACT

Background: The COVID-19 pandemic was caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) which spreads through aerosol produced during coughing or sneezing. Face masks, Goggles and face shields have become an essential part of Personal Protective Equipment (PPE) being used by the Health Care Workers (HCWs) involved in COVID-19 patient care. We aim to assess the level of ocular and peri-ocular discomfort in healthcare workers while using various protection strategies (goggles, face shields and masks) during the care of COVID-19 patients.

Materials and methods: This prospective observational Study included HCWs working in COVID-19 patient care after fulfilling the inclusion and exclusion criteria. The participants completed a questionnaire consisting of general questions, systemic and ocular co-morbidities, hospital practices, duration of health care work and regarding problems faced with goggles/ face shield/ face mask and their preferences.

Results: 110 HCWs participated in our study. Average age of the participants was 33.6 years. 57.3% were males. 83.6% were doctors. Hypertension and Dry eye were the most common systemic and ocular illness among the participants respectively. 56.4% needed prescription glasses. The quality of vision with goggles and face shield was significantly better as compared to face mask. Skin related problems such as skin abrasions, blisters or rash were significantly higher with the use of face mask.

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Conclusion: The HCWs faced moderate pain and difficulty in communication during patient care while using the three PPEs with no significant difference between the three PPEs in terms of discomfort/pain and communication with the patients. Face masks were associated with significantly poor vision and maximum skin related problems.

Keywords: COVID-19, face masks, face shield, goggles, PPE

1. INTRODUCTION

The coronavirus disease 2019 (COVID-19) was a viral pandemic that started in Wuhan Province in China and quickly spread to the rest of the world. (1) This infection is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease is spread through aerosol produced during coughing or sneezing that infects oral, nasal or other mucous membranes; and also indirectly through fomites i.e. surfaces or objects that have come in contact with the infected person.(2),(3) In addition, the virus has been also detected on the ocular surface of COVID-19-positive patients and in conjunctival secretions. (4) A retrospective study of three hospitals in Wuhan demonstrated that 1.4% of patients (three out of 214) had visual impairment, without specifying the nature of the impairments. (5) Wu et al. investigated the prevalence of ocular manifestations in patients with COVID-19 and found that chemosis, conjunctival hyperemia and epiphora were present in one-third of the patients. (6) Respiratory droplets with a relatively large size of 5–10 μm are emitted during an infected individual's cough or sneeze. (7) Aerosols have a diameter of less than 5 μm. (8) Considering this, masks, Goggles and face shields have become an essential part of Personal Protective Equipment (PPE) being used by the HCWs involved in COVID-19 patient care. N-95 Face masks protect transmission through the respiratory route as well as aerosols. (9)The masks are more effective when worn by the source of the virus. (10) The goggles are made of plastic and help protect against contamination of ocular mucosa by the virus. (11) Face shields provide a barrier of protection against droplets from coming into contact with the nose, mouth, and eyes, which may be the sites that get infected by the virus. However, these protective equipments are themselves associated with some form of discomfort associated with both short and long-term usage. We aim to assess the level of ocular and peri-ocular discomfort in healthcare workers while using various protection strategies (goggles, face shields and masks) during the care of COVID-19 patients.

2. MATERIALS AND METHODS

A prospective observational Study was conducted to assess the level of ocular and peri-ocular discomfort in healthcare workers while using various protection strategies (goggles, face shields and face masks) during care of COVID-19 patients. HCWs (Doctors, Nurses, Technicians/Attendants) working in COVID-19 patient care were included in the study after obtaining their written consent. HCWs with systemic diseases such as Diabetes, Hypertension, Bronchial asthma, Chronic obstructive pulmonary disease (COPD), Ischemic heart disease, Chronic kidney disease, and Chronic liver disease and ocular diseases like Dry

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eye, Retinal diseases, squint and Glaucoma were excluded. Pregnant women and patients with dementia (who cannot report functional symptoms) were also excluded.

Healthcare workers (Doctors, Nurses, Technicians/Attendants and others) working in the care of COVID-19 patients were included in the study starting from the period 1 April 2020 onwards. After giving their consent to participate in the study, the participants completed a questionnaire consisting of five general questions (Name, email-ID, age, sex, type of HCW); general clinical questions (systemic co-morbidities, ocular co-morbidities and usage of glasses); questions about their hospital practices; questions investigating duration of health care work; and questions regarding problems faced with goggles/ face shield/ face mask and their preferences.

Fig. 1: Questionnaire to be filled by the participants

QUESTIONNAIRE

1. Type of HCW?
2. Do you have any known systemic illness?
3. Do you have any known ocular illness?
4. Do you wear glasses?
5. What is the recommended practice in your hospital regarding protection of health care workers managing COVID-19 patients?
   O None O Goggles
   O Face shield O Face mask
6. What is the recommended practice in your hospital regarding protection of health care workers managing non-covid OPD patients?
   O None O Goggles
   O Face shield O Face mask
7. While working inside a COVID ward/ ICU, do you use protection at all times or only during close proximity to patients?
8. While working in non-COVID OPD, do you use protection at all times or only during close proximity to patients?
9. How will you rate your discomfort/ pain while using GOGGLES, on a scale of 0-5?
   O 1 O 2 O 3 O 4 O 5
10. How will you rate your quality of vision while using GOGGLES, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
11. How will you rate your communication with patients/ colleagues while using GOGGLES, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
12. Have you ever experienced the following due to use of GOGGLES? (Can tick more than one box)
    - Headache
    - Skin abrasions/ blisters/ rash
    - dryness/ itching/ burning sensation in eyes
    - Gritty/ foreign body sensation in eyes
    - No
13. How will you rate your discomfort/ pain while using FACE SHIELD, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
14. How will you rate your quality of vision while using FACE SHIELD, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
15. How will you rate your communication with patients/ colleagues while using FACE SHIELD, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
16. Have you ever experienced the following due to use of FACE SHIELD? (Can tick more than one box)
    - Headache
    - Skin abrasions/ blisters/ rash
    - dryness/ itching/ burning sensation in eyes
    - Gritty/ foreign body sensation in eyes
    - No
17. How will you rate your quality of vision while using FACE MASK, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
18. How will you rate your discomfort/ pain while using FACE MASK, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
19. How will you rate your communication with patients/ colleagues while using FACE MASK, on a scale of 0-5?
    O 1 O 2 O 3 O 4 O 5
20. Have you ever experienced the following due to use of FACE MASK? (Can tick more than one box)
    - Headache
    - Skin abrasions/ blisters/ rash
    - dryness/ itching/ burning sensation in eyes
    - Gritty/ foreign body sensation in eyes
    - No

The answers were graded and compiled on an Excel sheet for statistical analysis with SPSS software. Inadequate responses were excluded from the analysis. A level of $p < 0.05$ was used to determine statistical significance.

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3. RESULTS

110 HCWs (HCW) participated in our study by filling the online google form.

Table 1: Age wise distribution of the participants

Age	**No. of responses**
21-30	43
31-40	51
41-50	11
Above 50	5
Grand Total	**110**

Table 2: Gender wise distribution of the participants

Gender	**responses**
Male	57.3%
Female	42.7%

Majority of the participants were doctors followed by nurses. Pharmacy officers, research scholars and ward attendants also participated in our study.

Table 3: Type of HCW

Type of HCWs	**No. of responses**
Doctor	83.6%
Nurses	10.9%
Others	5.5%

Hypertension was the most common systemic illness and Dry eye was the most common ocular illness among the HCWs participating in the study. 56.4% HCW in our study needed prescription glasses.

Table 4: Recommended PPE practice while managing COVID-19 patients

Recommended practice in hospitals while managing COVID-19 patients.	**Count**
Goggles, Face shield, Face mask	60.9%
Goggles, Face mask	14.5%
Face mask	11.8%
Face shield, Face mask	10%
Goggles	1.8%

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Face shield	0.9%
Grand Total	**110**

61% participants said that in their hospital, goggles, face shield and face mask were all recommended to be worn while dealing with COVID patients.

Table 5: Recommended PPE practice while managing non-COVID-19 patients

Recommended practice in hospitals while managing non-COVID OPD patients.	**Count**
Face mask	45.4%
Face shield, Face mask	28.2%
Goggles, Face shield, Face mask	17.3%
No protection	5.4%
Goggles, Face mask	1.8%
No protection, Face shield	0.9%
Face shield	0.9%
Grand Total	**110**

45% participants said that in their hospital, only face mask was recommended while dealing with Non-COVID patients.
80% participants said they use PPE at all the times while dealing with COVID patients and 60.9% participants used PPE at all the times even while dealing with Non-COVID patients.
The participant HCWs spent 24.05 hours per week on an average on duty in COVID-19 ward/ICU and 21.06 hours per week in Non-COVID OPD in the last month.

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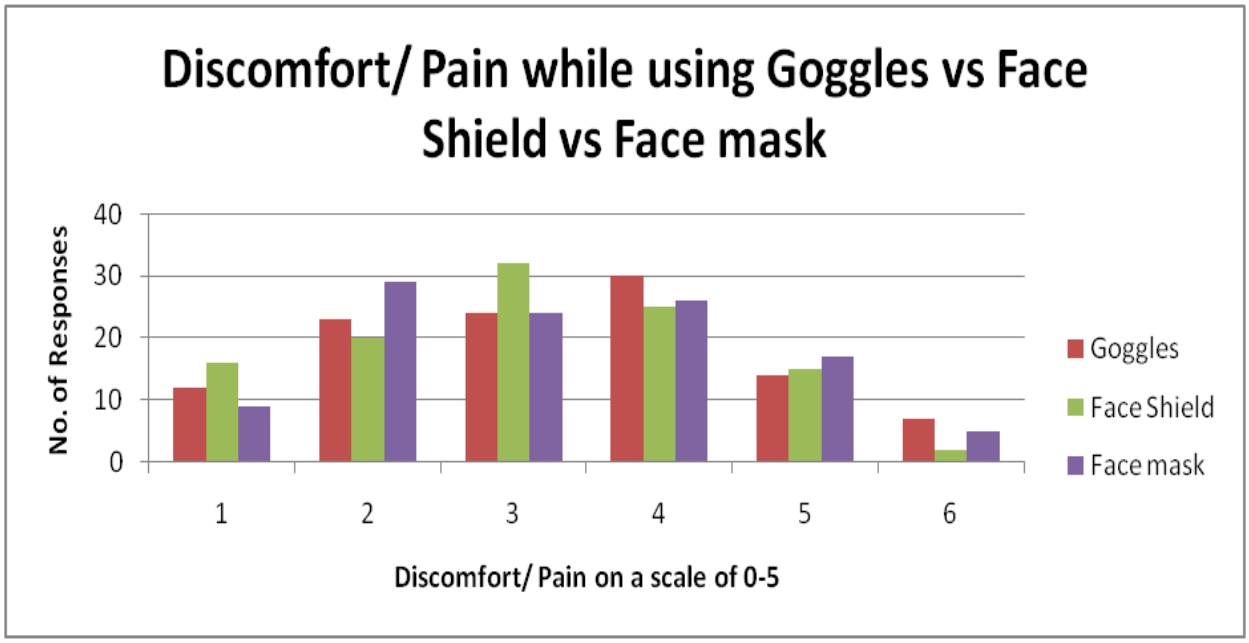
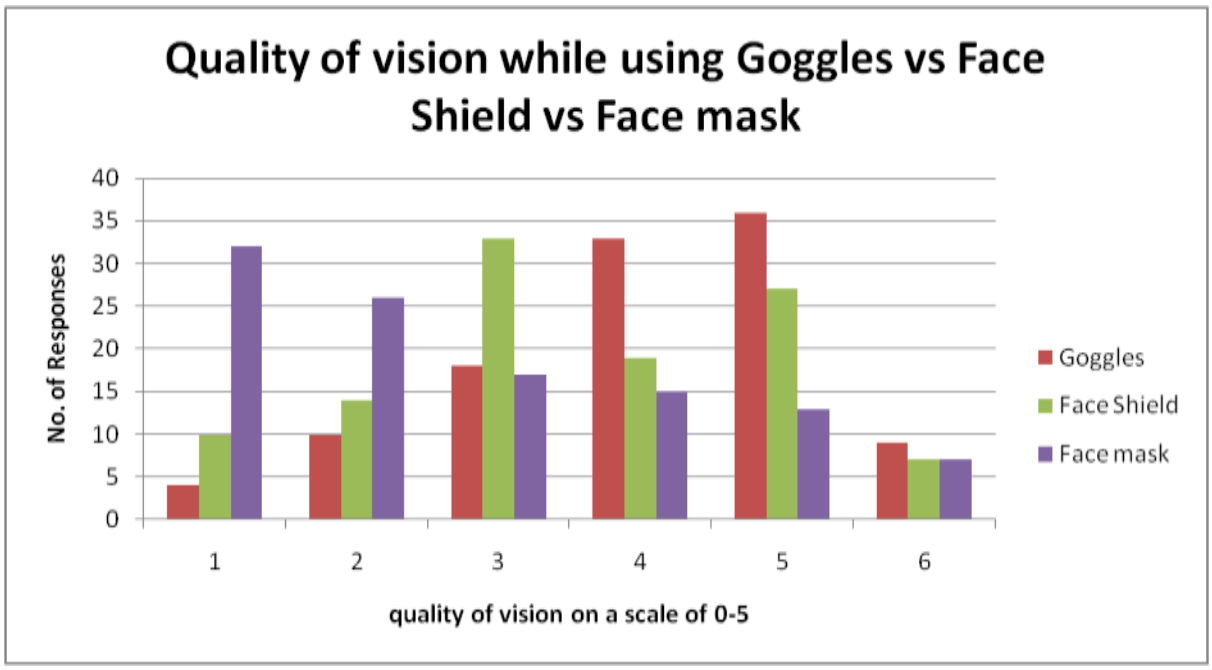
Fig. 2: Comparison of discomfort/pain score while using goggles, face shield or face mask



Average discomfort/pain score on a scale of 0-5 with goggles, face shield and face mask was found to be 2.29, 2.08 and 2.25 respectively and there was no significant difference between the three groups.

Fig. 3: Comparison of Quality of vision while using goggles, face shield or face mask



Average quality of vision on a scale of 0-5 with goggles, face shield and face mask was found to be 3.04, 2.54 and 1.74 respectively. So, *the quality of vision with goggles (P-value = 0.0074) and face shield (P-value < 0.0001) was statistically significantly better as compared to face mask.*

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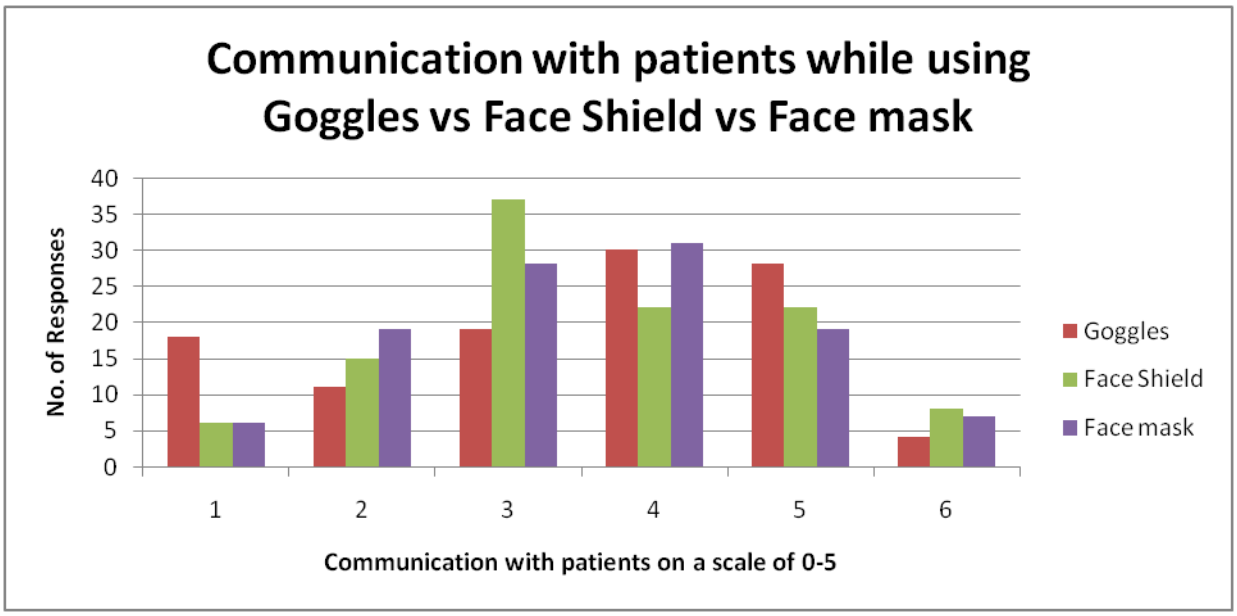
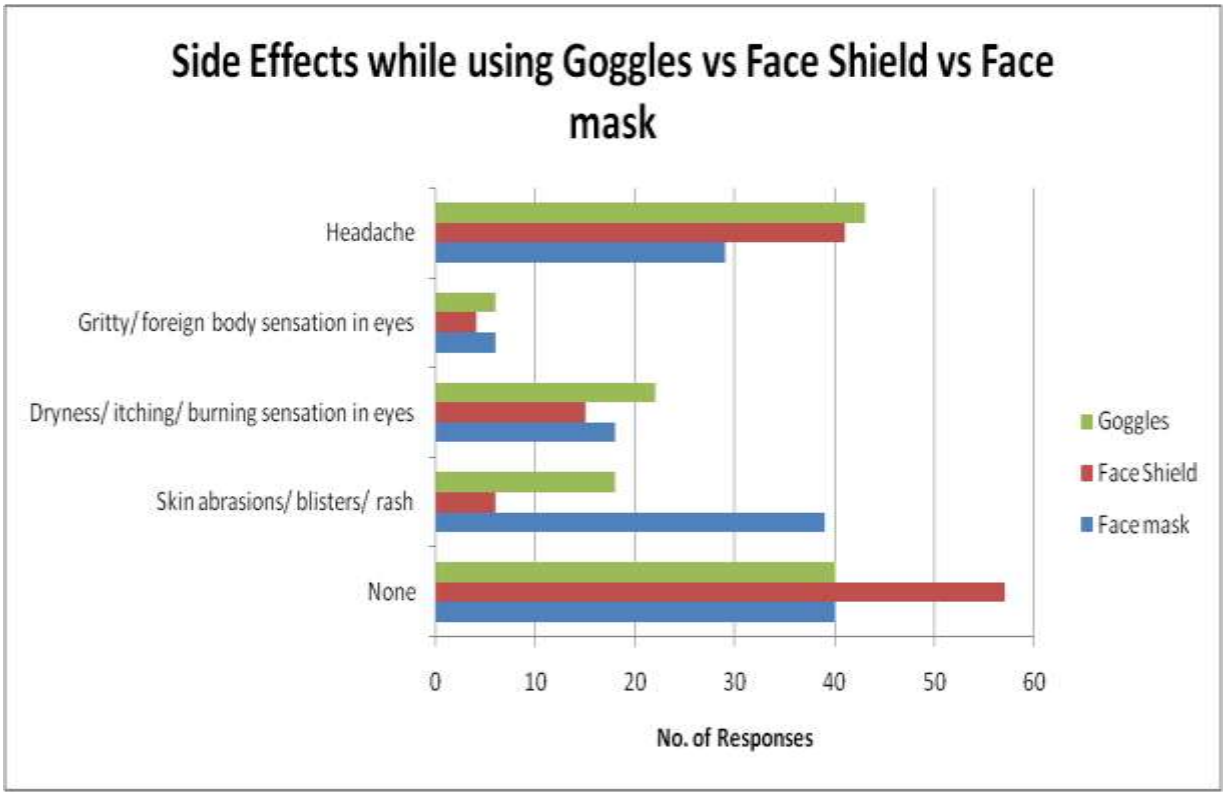
Fig. 4: Comparison of communication with patients while using goggles, face shield or face mask



Average communication with patient score on a scale of 0-5 with goggles, face shield and face mask was found to be 2.46, 2.57 and 2.54 respectively and there was no significant difference between the three groups.

Fig. 5: Comparison of side effects while using goggles, face shield or face mask



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Skin related problems such as skin abrasions, blisters or rash were significantly higher with the use of face mask as compared to goggles or face shield. But, headache was significantly lower with the use of face mask as compared to goggles or face shield.
Ocular side effects such as dryness, itching, burning sensation, gritty or foreign body sensation in eyes were almost equal in the three groups.

4. DISCUSSION

COVID-19 pandemic was a tough time for the world but even tougher for the front line HCWs dealing with COVID positive and patients with unknown COVID-19 status. COVID-19 is caused by severe acute respiratory syndrome corona virus 2 (SARS-CoV-2) which spread primarily through droplets during sneezing or coughing and indirectly through fomites. (2),(3) Room air ventilation and proximity to patient also determines the chances of transmission.(12) The HCWs need to be equipped with proper Personal protective equipments (PPE) all the time while dealing with patients. Face masks, Goggles and face shields have been in use due to a number of studies establishing that these PPEs reduce the chances of transmission of SARS-CoV-2 infection. WHO recommended the use of face masks during COVID pandemic.(13) Li Y, Liang M, Gao L, et al., Li Y, et al., Zhou SS, et al. proved the efficacy of face masks in preventing transmission of aerosols. (9),(14),(15) Li J.O., Lam D.S.C., Chen Y., Ting D.S.W. and Sayburn A. showed the importance of goggles as part of PPE. (16),(17) Face shield provide protection from direct splash contamination and also minimize the aerosol particle exposure. (18) But, after searching the literature extensively, we could not find any studies which studied in detail and compared these 3 PPEs in terms of comfort, vision, communication and side effects by the HCW's perspective. So, we prepared a google form and requested the front line HCWs to share their experience and rate the goggles, face shield and face mask in terms of discomfort/pain, vision and ease of communication with the patients and also the physical problems faced while using them.
In our study we found that there was no significant difference between the three PPEs in terms of discomfort/pain and communication with the patients. The mean scores were between 2 and 3 on 0-5 scale showing that the HCWs faced moderate pain and difficulty in communication during patient care. Face masks were associated with significantly poor vision and maximum skin related problems such as skin abrasions, blisters or rash compared to goggles and face shields. These results suggest that we need to find ways to tackle these problems. Visibility can be improved by undertaking measures to prevent fogging of goggle as suggested by Madan, Manu et al and Singh, Apoorv et al.(19),(20) Face shield is very effective in association with mask and goggles as it protects the face from blood splatter and also reduces the aerosol concentration. (21) Face masks should be worn correctly. It should fit tightly on to the skin. Breathing dampens the mask which may lead to air leak a bacterial infection. So mask has to be changed regularly.(22) More research is needed to tackle these problems so we can be ready for such health challenges in the future.

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Limitations

The sample size in this study is relatively small which may not represent entire population. So a large, multi-centre clinical study is needed to further validate the findings of this study.

Conflict of interest: None

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