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Ocular morbidities among glass factory workers at district Firozabad, Uttar Pradesh, India

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Abstract---Introduction- The health hazard of glass factories has been classified in the ILO encyclopedia. Injuries, heat exhaustion, respiratory morbidity, ophthalmic morbidity, and nephrolithiasis are conditions in Glass factories worldwide. Material and Methods: A descriptive study was conducted in the small-scale glass factory

situated in the district Firozabad, Uttar Pradesh, India, to estimate the eye conditions among glass factory workers. Informed consent was obtained from 140 respondents. The visual acuity was measured using Snellen's chart placed at six meters with adequate illumination. Each eye was tested separately for refractive error with and without glasses (where applicable), the dry eye with Schirmer strip, cataract with torchlight and direct ophthalmoscope, Conjunctivitis, and later refracted using retinoscope Trial & error method. Data analysis was done using the Statistical Package for Social Sciences (SPSSv16). Descriptive and inferential statistics were used to present the results of the study. Results: his study screened 140 participants, 2 of whom were female and 138 of whom were male. In a survey of 140 factory employees (76.42%), respondents reported no ocular complaints while at work. In (23.57%) of the employees, Asthenopic symptoms continued. 15.71% were reported feeling dryness at work. Redness, watering, and scratching were registered to be (7.14%), (8.57%), and (8.57%), respectively. Out of 140 participants, 50 (35.71%) had refractive error between 2 females and 48 males, with visual acuity less than or greater than 6/9. The degree of refractive error was rated as low, moderate, or high. After correction, (33.57%) of the people have a refractive error. Cataract affects (18.57%), while (65.22%) are free of any related visual morbidities. (13.2%) experience dryness, while (1.42%) experience conjunctivitis and pain of the eyes. Conclusion: Refractive error is one of the major areas of concern among glass factory workers. The high percentage of eye conditions recorded in this study calls for practical measures as episodic eye examinations, encouraging regular use of protective eyewear, and health awareness programs to be conducted to prevent secondary complications and injury and to reduce the burden of ocular conditions.

Keywords---glassblower, occupational hazards, eye conditions, eye protection.

Introduction

Discovery, Researches have made lifespan more comfortable and easier. These discoveries can cause some time paramant anatomical and physiological damage due to hazards in factory workers. According to the International Labour Organization, an estimated 50 million work-related injuries occur every year or 160000 every day. As mentioned below in the glass trade as ILO encyclopedia, several hazards are:^[11] 1. Accidents 2. Silica 3. Lead 4. Alkaline dust 5. Other raw materials 6. Fuels and products of combustion 7. Miscellaneous hazards 8. Heat and radiant energy 9. Glass blowing. 10. Heat cataract 11. Noise. Glass is a transparent and translucent material that has no crystalline structure. It is an inorganic product produced by melting a mixture of silica sand, soda ash, and the cullet at the temperature of about 12000°C to 15000°C. Modern glass industries have three parts: the batch house, the hot end & the cold end. The workers working in them usually get exposed to all parts of the operation. The health

hazard of glass factories is enlisted in the International Labor Organization encyclopedia.^[1] In district Firozabad, most workers are uneducated and belong to a low economic state with a lack of knowledge. These workers need to work at an unbelievably cheap cost for their daily livings in the glass manufacturing industries. Moreover, the eye and health hazards they face are due to dim light working stations, small chambers, improper ventilation, and poor and unhygienic working conditions. Defective vision is quite challenging, which persists after a long period of continuous exposure to the surroundings. Uncorrected refractive error and presbyopia are common among these workers due to the non-availability of eye care services.^[1] Due to these uncorrected refractive errors and poor management, eye injuries frequently occur with a high risk of ocular trauma. In developing countries, the workers are mostly exposed to occupational risk such as variable temperature (excessive heat and cold), the humidity of the air, dampness inducing chill, low air movement, and defective lighting in the workplace. ^[6] Due to the above-said issues, the objective of our study is to determine the visual status and the prevalence of refractive error in the glassblowers of the district Firozabad, UP, India.

Methodology

A descriptive study was conducted in the small-scale glass factory situated in the district Firozabad, Uttar Pradesh, India. Informed consent was obtained from 140 respondents. The visual acuity was measured using Snellen's chart placed at six meters with adequate illumination. Each eye was tested separately for refractive error with and without glasses (where applicable) and later refracted using Retinoscope and Trial & error method. If visual acuity was less than normal, i.e., 6/6, then the refractive error was further classified into myopia, hyperopia, and astigmatism. Near visual acuity was tested using the N Notation reading chart. Near correction was given to those who have near visual acuity less than N6 to correct presbyopia. Visual acuity in the better eye was divided into the following groups as Normal (6/6), Mild (6/9 – 6/18), Moderate (6/24 – 6/36), & Severe (6/60 or less). Colour vision was tested using the Ishihara pseudo-isochromatic plates, and the findings were noted as normal or abnormal. Torchlight examination was done with a pen-torch to rule out any anterior segment abnormalities. A close-ended questionnaire was also given to the responders. (Annexure-1) All the workers who participated in the vision screening camp were recruited, and there are no exclusion criteria for this study. Data analysis was done using the Statistical Package for Social Sciences (SPSSv16). Descriptive and inferential statistics were used to present the results of the study.

Annexure-I

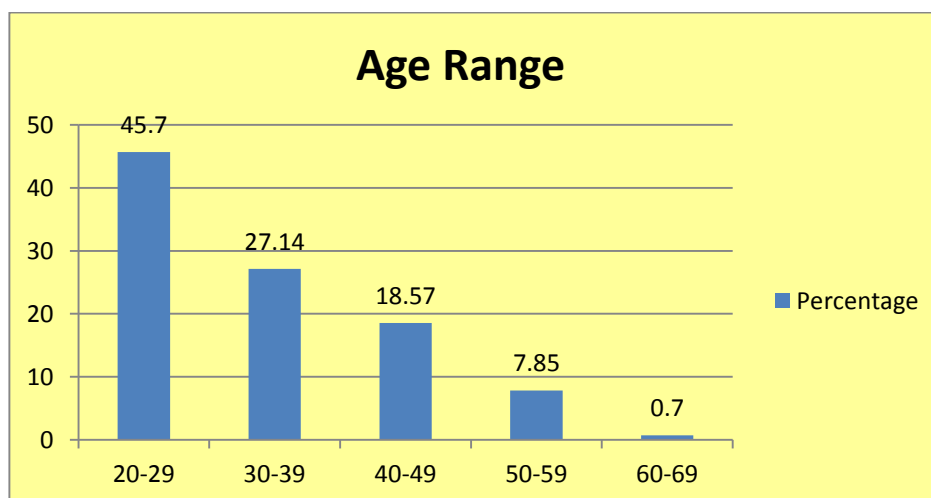
Q.1 Did you ever get your Eye examination?	
(a) Yes	(b) No
Q.2 Do you have any eye complaints?	
(a) Yes	(b) No
Q.3 Do you have any systemic disease?	
(a) Yes	(b) No
Q.4 Is there any ocular disease in your family?	
(a) Yes	(b) No

Q.5 Is there any spectacle wearer in your family?	
(a) Yes	(b) No
Q.6 How many hours do you work in this glass factory per day?	
(a) 4 to 5 hours	(b) 6 to 7 hours
Q.7 Are you using safety glass/goggles at the time of work?	
(a) Yes	(b) No
Q.8 Did you feel any complaint given below at the working time?	
(a) Asthenopic symptom (headache, blurred vision, eye ache, etc.)	[Yes/No]
(b) Watering and itching in eyes	[Yes/No]
(c) Irritations and foreign body sensation	[Yes/No]
(d) Redness	[Yes/No]
(e) Dryness	[Yes/No]
Q.9 Do you have any previous history of eye injury at the time of your work?	
(a) Yes	(b) No

Result

This study screened 140 participants, 2 of whom were female and 138 of whom were male. These participants ranged from 20-69 years with a mean age of (33.19 ± 9.58) years. (45.7%) are between the ages 20-29 years, (27.14%) are between 30-39 years, (18.57%) between 40-49 years while (7.85%) belongs to 50-59 age group category and (0.7%) were under 60-69 category. (Fig-1)

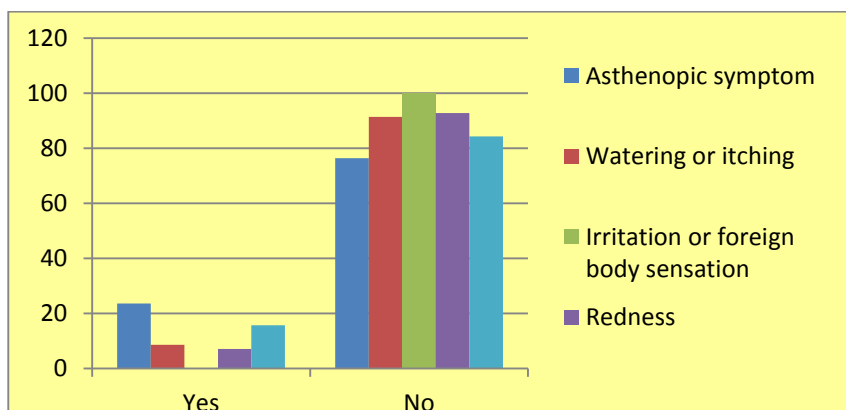
FIG-1 Age Group Distribution chart



Ocular Complains During Work

In a survey of 140 factory employees (76.42%), respondents reported no ocular complaints while at work. In (23.57%) of the employees, Asthenopic symptoms continued. (15.71%) reported feeling dryness at work. Redness, watering, and scratching were registered to be (7.14%), (8.57%), and (8.57%), respectively. (Fig-2)

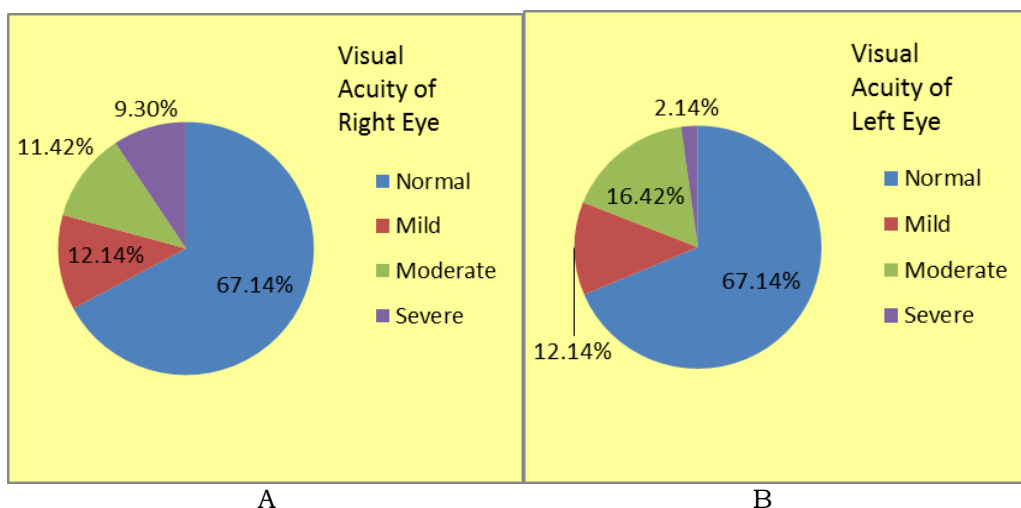
FIG-2 Distributions of Ocular Complaints



Visual Acuity in Eyes

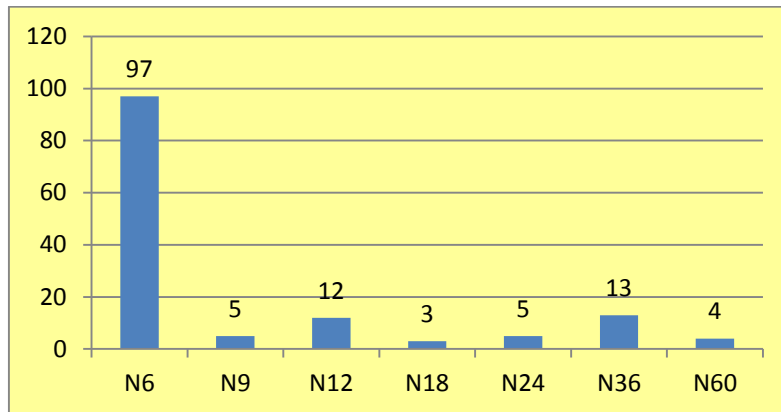
The distributions of visual acuity in both eyes are depicted in the figure. (Fig-3A & 3B) According to the WHO classification, 34 eyes fell into the poorly distance category of mild visual acuity (6/9 – 6/18). 39 eyes had visual acuity ranging from (6/24 – 6/36) and 16 eyes had severe visual acuity.

FIG-3 Distance Visual Acuity



Near visual acuity was also assessed on the participants, 38 (27.12%) over 40. The following graph shows that (69.28%) have near visual acuity of N6, while the remaining (30.72%) have near visual acuity less than N6. (Fig-4)

FIG-4 Distribution of Near Visual Acuity Binocularly



The Chi-square test was used to determine the statistical significance of age, exhibiting visual acuity, refractive status, and near vision. The statistical significance was compared between each value separately between ages and exhibiting visual acuity Uni-ocularly indicating a statistical significance of ($P = 0.000$). A statistical significance value of ($P = 0.000$) was displayed between age and near visual acuity.

Refractive Status

Out of 140 participants, 50 (35.71%) had refractive error between 2 females and 48 males, with visual acuity less than or greater than 6/9. (Fig 5 and Table-1) display the distribution of refractive error in both eyes separately. The degree of refractive error was rated as low, moderate, or high. After correction, (33.57%) of the people have a refractive error. Cataract affects (18.57%), while (65.22%) are free of any related visual morbidities. (13.2%) experience dryness, while (1.42%) experience conjunctivitis and painful eyes. (Fig-6 and Table-2)

Fig -5 Distribution of refractive error in Right and Left Eye

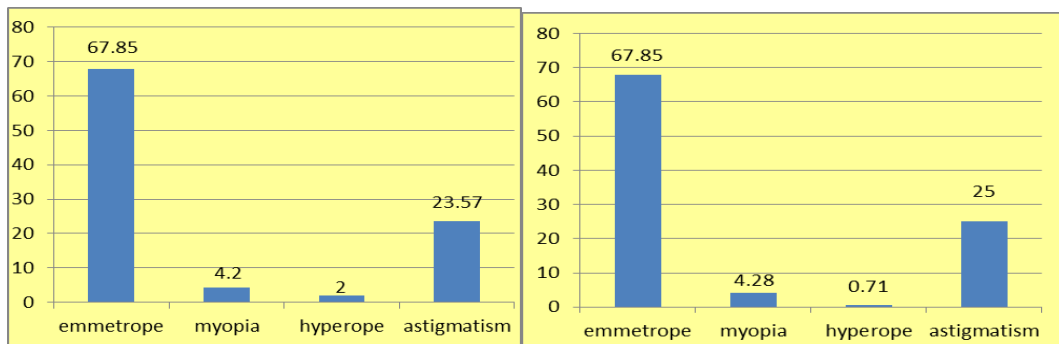


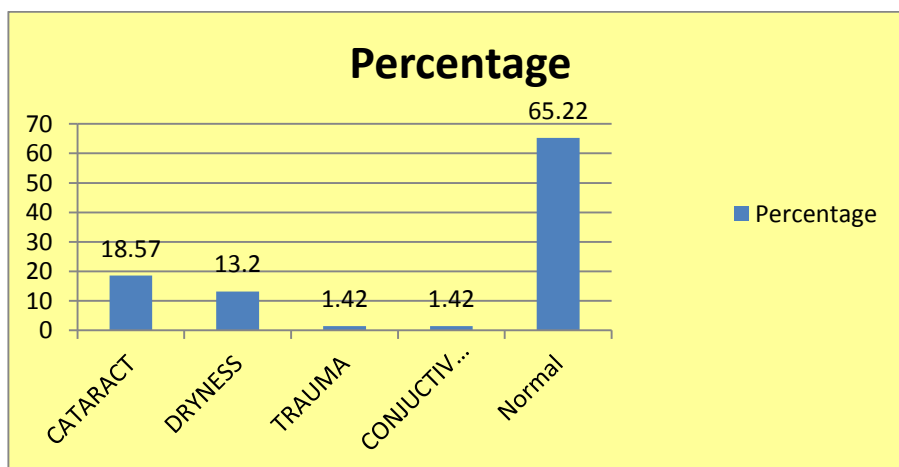
TABLE-1 Distribution of Refractive Error

Refractive Error	OD	OS
Myopia	4.28%	4.28%
Hyperopia	2.14%	0.71%
Astigmatism	23.57%	25%

TABLE: -2 Distribution of a Questionnaire Response in Percentage

QUESTION	YES	NO
Did you ever get your Eye examination?	17.85%	82.14%
Do you have any eye complaints?	32.14%	67.85%
Do you have any systemic diseases?	10%	90%
Is there any ocular disease in your family?	2%	98%
Is there any spectacle wearer in your family?	58.57%	41.42%
Are you using safety glass/goggles at the time of work?	0%	100%
Do you have any previous history of eye injury at the time of your work?	6.42%	93.57%
EXPERIENCING COMPLAINTS DURING WORK		
Asthenopic symptom (headache, blurred vision, eye ache, etc.)	23.57%	76.43%
Watering and itching in the eyes	8.57%	91.43%
Irritation or foreign body sensation	0	100%
Redness	7.14%	92.86%
Dryness	15.71%	84.29%

FIG- 6 Ocular Morbidity among Glass Workers



Discussion

During a person's lifetime, the most hours spent other than at home is the workplace. This research comes under the category of Occupational Optometric practitioners, concerned with effective and healthy visual functioning at work. The researcher aimed to measure eye risk and map out a solution pattern by

prescribing appropriate treatment that will help control preventable occupational eye hazards, i.e., blindness, the driving force of our present study. Staff from the small-scale sector volunteered to take part in the report. The most practical sampling approach was used. The obtained findings were within the scope of the study. The employee's mean age $\pm$ standard deviation was 33.19 years old $\pm$ (9.72). This is equivalent to a study in which the mean age $\pm$ standard deviation of glass employees was estimated to be 29.3 years $\pm$ (9.8).^[1] The existing research also supports creating baseline data on the visual status of the workers in Glassmaking industries. Our research indicates about 67.85% of the workers have their visual acuity normal. According to the International Classification of Diseases-11 criteria (2018), around (25.17%) (n =36) of the workers were visually impaired, having their visual acuity less than 6/12.^[3] Significant visual impairment (visual acuity between 6/18 -6/60) was observed in 21.8% of individuals by Rajiv Desai et al. 1990 study conducted in India. ^[4] Around (30.71%) of the workers could not read the newspaper at the distance of 40 cm (presbyopia); these findings are similar to the study conducted in Nigeria, where (31.4%) of the population working in the industrial area could not read newspaper print at the distance of 40cm. ^[5] The prevalence of refractive error was found to be (35.71%), which was statistically significant compared to age (P =0.000). Astigmatism was the most common refractive error, accounting for 25% of all refractive errors^[14,15]. Astigmatism was also more common among participants who had cataracts (n =21). Several studies have found a connection between age and the prevalence of astigmatism in cataract patients^[18,19,20]. Still, the evidence does not support this conclusion because the results varied between studies performed in similar and different geographies. ^[6, 7, 8, 9] Glassblower cataract is the appropriate phrase for cataract that develops in workers in glass factories, which in this study was stated to be 18.6%. It has been documented that occupational infrared radiation exposure of glassworkers hastens the development of senile changes in the lens, which leads to cataracts.^[9] working in a hot atmosphere for an extended period destabilize the tear film integrity. In our study, around (13.2%) of the respondents were diagnosed with dry eye when examined with a Schirmer strip^[17,21]. In one analysis, it was discovered that raising the ambient temperature to 25°C resulted in a threefold increase in tear evaporation rate (P=0.00). ^[10] As the glassworkers are constantly in touch with the hot environment, it causes their tears to evaporate faster, which in turn causes dryness. According to David ben kumah et al. 1 2017, there is a high prevalence rate of fire workers who do not use protection during work. ^[12,13,16]

Conclusion

This research shows that the most prevalent ocular conditions in the Glass factory workers are Visual Acuity (less than normal), Refractive error (mild, moderate & severe), Cataract, Dry eye, Conjunctivitis. The occurrence of refractive error is one of the major areas of concern among glass factory workers. The high percentage of eye conditions recorded in this study calls for practical measures as episodic eye examinations, encouraging regular use of protective eyewear, and health awareness programs to prevent secondary complications and injury and reduce the burden of ocular conditions.

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References

1. Krishnakumar R, Rashima A, Santanam P.P. Occupational Optometry Service – An Overview, *Sci J Med & Vis Res Foun* 2016; XXXIV (1): 20–22.
2. Brahmapurkar KP, Lanjewar AG, Zodpey SP, Shrote VK, Q.H khan, Khakse GM, Teeku Singha, Giri VC, Shrivastava P.K. Morbidities in the Glass Factory Workers of Central India. *IOSR Journal of Dental and Medical Sciences* 2013; Volume 7(6): 29-33.
3. WHO. International Statistical Classification of Diseases and Related Health Problems (ICD): ICD-11 (Internet) (11th revision) Available from: <https://www.who.int/standards/classifications/classification-of-diseases>.
4. Desai R, Desai S, Desai N, Kumar K. Visual status of Industrial workers. *Indian J Ophthalmol* 1990; 38: 64-65.
5. Okoye OI, Umeh RE. Eye health of industrial workers in Southeastern Nigeria. *West Afr J Med* 2002; 21(2): 132-137.
6. Chen W, Zuo C, Chen C, et al. prevalence of corneal astigmatism before cataract surgery in Chinese patients. *J Cataract Refract Surg.* 2013; 39(2):188–192.
7. Ercegovic A, Brajkovic J, Surac IK, Haluzan MB. Prevalence, distribution and types of corneal astigmatism in cataract surgery patients in Sibenik County. *Acta Clin Croat* 2012; 51(2): 275–278.
8. Khan MI, Muhtaseb M. Prevalence of corneal astigmatism in patients having routine cataract surgery at a teaching hospital in the United Kingdom. *J Cataract Refract Surg* 2011; 37(10): 1751–1755.
9. Prakairunghong N, Charukamnoetkanok P, Isipradit S. Prevalence of preoperative corneal astigmatism in patients undergoing cataract surgery at Mettapracharak Hospital, Thailand. *J Med Assoc Thai* 2015; 98(9):878–882.
10. Abusharha AA, Pearce EI, Fagehi R. Effect of Ambient Temperature on the Human Tear Film. *Eye Contact Lens* 2016 Sep;42(5):308-12.
11. ILO Encyclopedia of Occupational Health and Safety, Vol. I., 3rd (revised) ed., 1983 ILO: 966 – 970.
12. Kumah DB, Mohammed AK, Ablordeppey RK, Arthur E, Kyeremeh S, et al (2017) Eye Conditions among Fire Officers in the Page 4 of 5 Brong Ahafo Region, Ghana. *Int J Open Access Ophthal* 2(1): 5.
13. Waheed A, Kumari N, Ali J, Dubey G, Kumari V, Kumari R et al. Cause of amblyopia in adult patients: a cross-sectional study. *Int J Community Med Public Health* 2021; 8:4955-9. DOI: <https://dx.doi.org/10.18203/2394-6040.ijcmph20213801>.
14. G. Dubey., S. Tomar., K. Pant., Tripathi, Sandeep., D, Gupta., (2021). Assessment of Ametropia in School Children Among Urban Areas of District

- Etawah: An Observational Study. Biosc. Biotech. Res. Comm. Special Issue 14 (07). 463-468. DOI: <http://dx.doi.org/10.21786/bbrc/14.7.96>
15. G. Dubey., S. Tomar., K. Pant., D. Gupta., (2021). ESTIMATION OF REFRACTIVE ERROR AMONG SENIOR SECONDARY SCHOOL CHILDREN OF RURAL AND URBAN COMMUNITIES AT DISTRICT ETAWAH. Vidyabharati International Interdisciplinary Research Journal (Special Issue) on Fostering Human Resilience-Catalyst for Management, Science and Technology, 475-481.
 16. Agarwal Antriksha., Singh, Mahendra., Dubey, Gaurav., Ali, Jamshed., Saxena, Ria., Ansari, Ahateshaam., Mishra, A.K., Verma, Chanchal., Ali, Javed., Md Masihhuzzaman., (2021). Optimization of Routine Eye Examination in Asymptomatic Patients in Tertiary Eye Care Center in Western Uttar Pradesh. Biosc. Biotech. Res. Comm. Special Issue 14 (07). 186-190. DOI: <http://dx.doi.org/10.21786/bbrc/14.7.44>
 17. Dubey Gaurav., Mohapatra, Aysworya., Ali, Jamshed., Chandra, Mahesh., Singh, Jitendra., Md Masihhuzzaman., Dubey, Neha., Kumari, Ragni., (2021). Investigations of the Dry Eye: An Overview. Biosc. Biotech. Res. Comm. Special Issue 14 (07). 211-217.
 18. Kumari, R., Singh, K.P., Dubey, Gaurav., Srivastava, M.R., Awasthi, A.A., Janardhanan. R., (2020). Astigmatism as a Cause of Headache - A Clinical Study. IJMSRC, 3(4), 364-371.
 19. Kumari, R., Saeed, A., Srivastava, M. R., Janarthanan, S. D., Dubey, G., Kumari, V., Bhavika, & Janardhanan, R. (2020). Prevalence of Refractive Error among School Children in Uttar Pradesh- An Eye Screening Camp in Government Schools. Solid State Technology, 63(3), 4130-4135.
 20. Kumari, R., Srivastava, M. R., Dhavamathi, J. S., Awasthi, A. A., Dubey, G., Chandra, M., Kumari, V., Prabhu, A. V., Garg, P., & Janardhanan, R. (2020). Prevalence of Refractive Errors in Type 2 Diabetic Patients in Northern India. European Journal of Molecular & Clinical Medicine, 7(6), 91-98.
 21. Dubey, G., Prabhu, A. V., Khan, T., Pant, k., Kumari, R., & Chandra, M. (2020). Role of Polyunsaturated Fatty Acid Derivative Flaxseeds in the Treatment of Dry Eyes- An Overview. International Journal of Current Research and Review, 12(23), 35-40. DOI: <http://dx.doi.org/10.31782/IJCRR.2020.122312>