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Student's understanding about the ozone layer and its conservation: a quiz study on the occasion of ozone day

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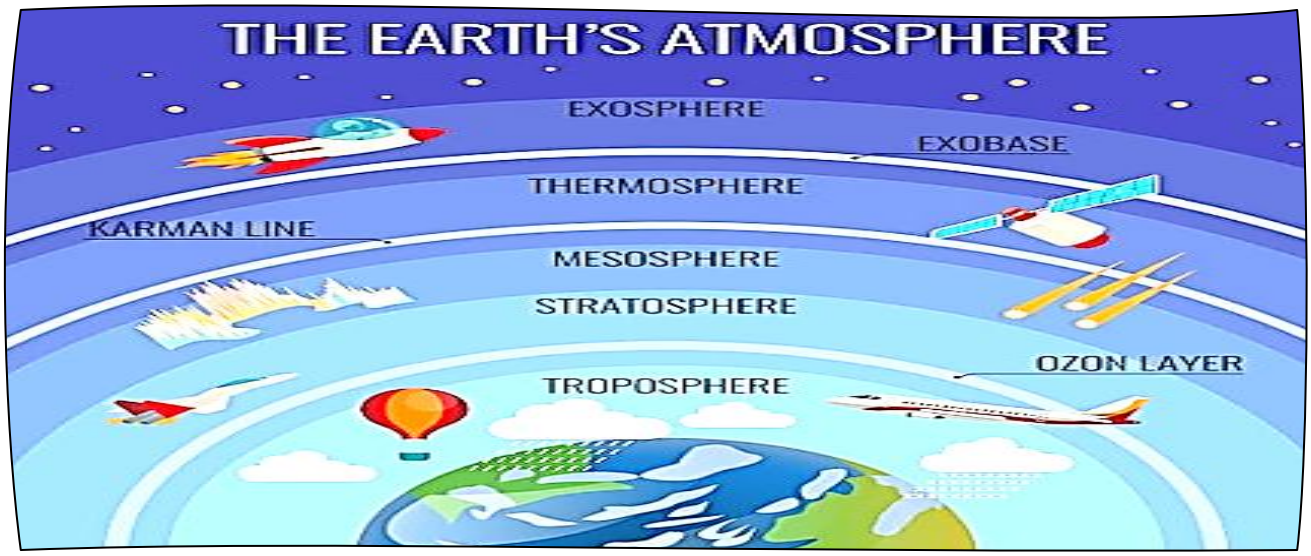
Abstract

This study explores the understanding and awareness of undergraduate and postgraduate students regarding the ozone layer and its conservation in alignment with the observance of International Ozone Day on 16th September 2024 in Dr. B. R. Ambedkar Government Girls P.G. college Fatehpur, India. The research investigated students' knowledge and level of awareness about ozone layer depletion, its causes, consequences, and preventive measures for today and for future. The findings reveal varying degree of knowledge and awareness in students i.e. the students showed low level of knowledge of type of Sun-rays the ozone layer absorbs, the delicate relationship of ozone hole and global temperature rise and how do chlorine atoms destroy ozone molecules in ozone layer etc. although they showed fair amount of awareness about the major source of chlorofluorocarbons, effect of ozone layer depletion is related to the increased risk of eye and skin diseases etc. This study recommends the need for enhanced educational initiatives to promote environmental responsibility among college students.

Key words: Ozone layer, chlorine atoms, CFCs, chemical pollutants, student awareness, ozone conservation

Introduction

The ozone layer, a crucial component of Earth's stratosphere, plays a vital role in protecting life by absorbing the majority of the Sun's harmful ultraviolet (UV) radiation round the year. However, many human activities, particularly the release of ozone-depleting substances (ODS) such as chlorofluorocarbons (CFCs), have led to ozone depletion (UNEP, 2020). Every year International Ozone Day gets celebrated on September 16th, aims to raise awareness about ozone layer protection for our secure future.



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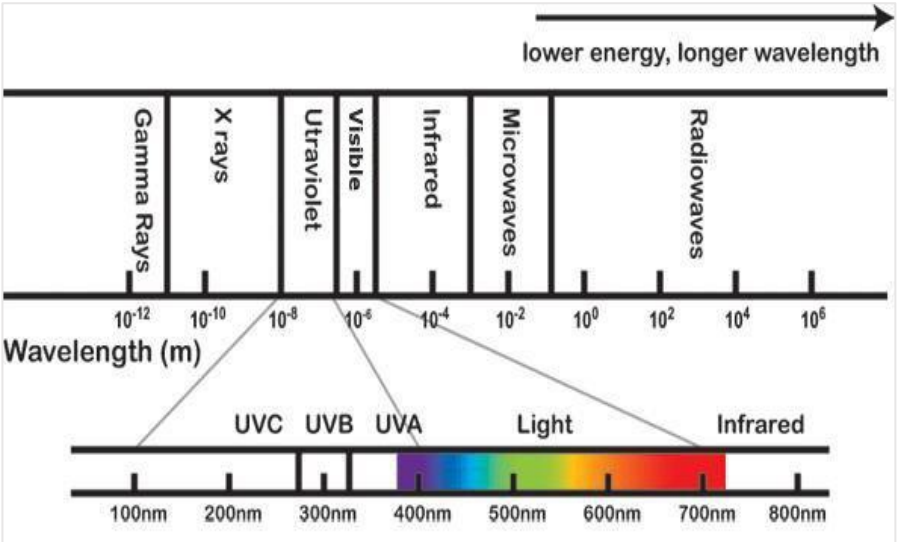
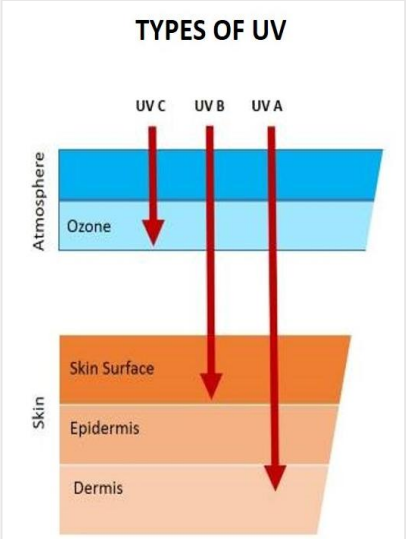
This study assessed the level of understanding among graduate and post-graduate students regarding the ozone layer, its significance, causes of depletion, and conservation strategies used by the international community at the moment.

Methodology:





A survey-based study (containing 20 questions) was conducted among graduate and post-graduate students of Dr. Bhimrao Ambedkar Government Girls P.G. College across multiple disciplines. A structured questionnaire with sections on ozone layer basics, causes of depletion, consequences, and conservation measures was distributed online for a limited period of time (~ 1.5h) in which ~ 70 students from different education disciplines were participated. The responses were analysed using descriptive statistical methods.

Results and Discussion:

The survey contained 20 questions related with the components of Ozone layer, ozone depletion, measures taken by international community and future needs to conserve the Ozone layer. The results indicated that-

Q. no.	**Question asked in the survey**	**Correct answer**	**Students answered correctly (%)**
1	What mainly causes ozone layer depletion?	CFCs use	85.10
2	Which sun rays does the ozone layer absorb?	UV-C	24.30*
3	Is the hole in the ozone layer the main cause of global temperature rise?	No, it is related with the Green House Effect	45.90*
4	Which is the major source of chlorofluorocarbons (CFCs)?	Refrigerator and aerosol	81.10

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5	Who is most at risk from depletion of the ozone layer?	Ecosystem, agriculture and human health (all)	68.90
6	What is the objective of the Montreal Protocol?	Eliminating CFCs and other ozone-depleting substances	81.10
7	The effect of ozone layer depletion is related to the increased risk of which diseases?	Skin cancer and eye problems	91.90
8	Are the processes causing damage to the ozone layer entirely man-made?	Both natural and man-made	63.50
9	In which season does the ozone hole expand maximum?	Spring	33.80*
10	What is the biggest anthropogenic activity that damages the ozone layer?	Use of aerosol products	50.00
11	Is it possible to rebuild the ozone layer?	Yes, but it will take hundreds of years	39.20*
12	Which type of skin diseases are at increased risk due to UV-B rays?	Skin cancer	89.20
13	Which chemicals are being used as alternatives to CFCs?	Hydrofluorocarbons (HFCs)	66.20
14	Can ozone gas in the atmosphere also cause pollution?	Yes, if it occurs in the troposphere	50.00
15	Is complete restoration of the ozone layer possible if emissions of CFCs end now?	Yes, but it will take more than a century	31.10*
16	Which new technology can be most effective for protecting the ozone layer?	Solar radiation management	40.50
17	Can ozone layer depletion accelerate climate change?	Yes	58.10
18	How do chlorine atoms destroy ozone molecules?	By splitting ozone molecules	41.90*
19	Can efforts to protect the ozone layer also solve other environmental problems?	Yes, it will also control climate change	77.00
20	What can be the most effective global policy for protecting the ozone layer in the future?	Complete ban of CFCs	67.60

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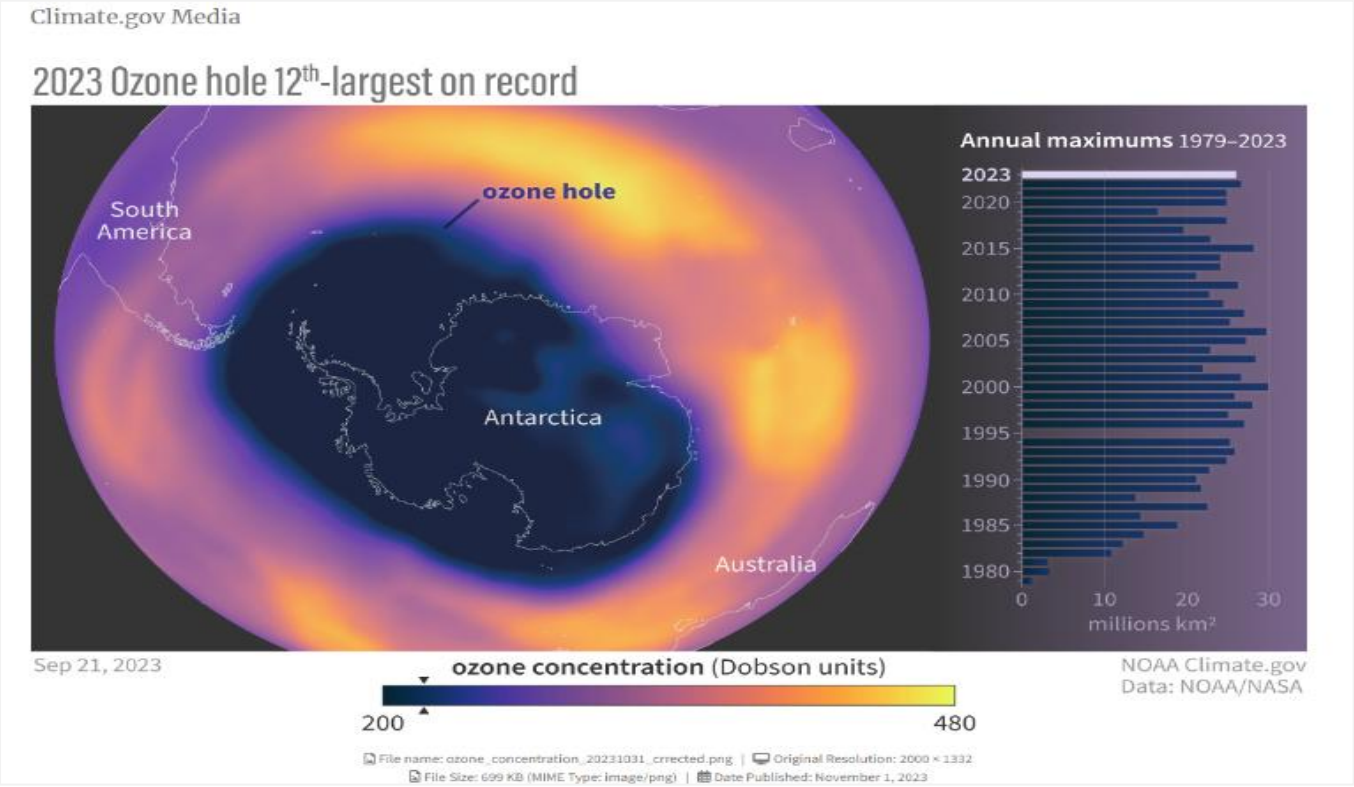
Table 1: Results of the survey describing questions, correct answer and the percentage of students answered correctly. The asterisk (*) denotes student's awareness < 50%.

The mean correct answer percentage of the all 20 survey questions for all participants was found 59.06 % including minimum 1 correct answers and maximum of 20 correct answers I. Students find 6 questions difficult as their mean correct answer percentage was found 24.30% for question 2; 45.90% for question 3; 33.80 % for question 9; 39.20 % for question 11, 31.10 % for question 15 and 41.90 % for question 18.

Students showed gaps in their knowledge for different components of solar radiation, reason for global temperature rise, seasonal fluctuation in ozone hole and its reasons, process and possibility of ozone rebuilding or restoration and how chlorine atoms destroy ozone molecules which shows students lack of knowledge and understanding for ozone layer conservation. Overall, this study identified knowledge gaps, particularly regarding the mechanisms of ozone depletion and the role of natural processes for its restoration. Enhanced educational programs focusing on these areas could improve understanding.



Conclusion/ Inferences:

The findings underscore the need for targeted educational campaigns on ozone conservation among graduate and post-graduate students. Integrating environmental education into students' curricula and observing events like International Ozone Day can significantly bolster awareness and proactive behaviour.

Author contributions: RK apprehended and perform the experiment. RK wrote the final draft of manuscript.

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