**Assessment of Pharmacy Students’ Knowledge and Attitude towards Environmental Education and Impact of Environmental Change on Health**

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**ABSTRACT**— Every academic subject play important role in respective field. Due to global warming, importance of environmental science subject has gained significant attention in all field including pharmacy. Objective: The present study made an attempt to assess pharmacy student knowledge and attitude towards environmental education and impact of environmental change on health. Methods: This study was a cross-sectional classroom survey among D Pharm, B Pharm, M Pharm and Pharm D students. The survey tool was distributed to 514 students in pharmacy college in Manipal, Karnataka, India. A brief introduction of study objective was provided to students and were instructed to respond independently. Results: Of all the respondents (n=514) 51% of respondents are of opinion that environmental science is one of the important subject at school/college level. 82% of the respondents felt that deforestation is major factor for environmental damage or climate change. 78% of respondents opined that, it is responsibility of every individual to protect environment. According to 70.4% of respondents change in environmental climate have affected human health. Conclusion: The study results revealed that the participating pharmacy students were aware of environmental issues. Students had positive attitude towards environmental science education and are concern about impact of environmental change on health.

**KEYWORDS:** Environmental, Education, Knowledge, Attitude, Health

1. **INTRODUCTION**

Environment is a conditions in which a person, animal, or plant lives or operates. Environmental education is a process that encourages people to experience environmental issues, participate in problem solving and take action to improve the environmental issues. Because of environmental education, people are developing a better understanding of environmental issues, and have the capacity to make educated and responsible decisions. The components of environmental education involve knowledge, awareness, understanding of the climate and environmental problems. Attitudes of concern for the environment and motivation to improve or maintain environmental quality is the need of the hour. Participation in activities that lead to the resolution of environmental challenges, increases public awareness and knowledge of environmental issues [1]. However, change in climate pattern due to disturbance and damage of environment have affected our health. According to WHO due to environmental changes and ecosystem impairment, some of the direct health impacts are floods heatwaves, water shortage, landslides, exposure to ultraviolent radiation exposure to pollutants. Ecosystem-mediated health impacts are altered infectious diseases risk, malnutrition, depletion of natural medicines and mental health. Between 2030 and 2050, climate change is expected to cause approximately 250000 additional deaths per year from malnutrition, malaria, diarrhea and heat stress [2,3,4]. Pharmaceutical profession and industry play important role in environment, as this profession deals with various chemicals and discharge huge amount of waste in to the environment. Hence every pharmacist should be aware of importance of environmental education and impact of environmental change on health. During, school, college and graduation study period, young pharmacist are exposed to various issues of environmental education and impact of environmental change on health. The present study made an attempt to recollect their knowledge and attitude towards environmental issues and its consequences on health. The objective of this study was to assess pharmacy students’ awareness, perceived knowledge and attitude towards environmental education and impact of environmental change on health.

**2. STUDY DESIGN**

The study was conducted as a cross-sectional classroom survey. The study was based on primary and secondary data research. The primary data was collected through self-administered questionnaire. Secondary data was collected through various research, review and newspaper articles. A survey instrument with 13 questions were formulated. This was web‑based survey conducted using “Google forms.” In the given questionnaire, only closed-ended questions were included. The questionnaire was initially validated and pilot testing was conducted among 5 students for contents before data collection. The validated questionnaire was sent to the e‑mail addresses of students currently pursuing their pharmacy degree. The survey was conducted among (1st to 4th year B. Pharm), (1st to 6th year PharmD) and (1st to 2nd M. Pharm) students. Students independently responded to the questionnaire. The study was approved at Department level. After one week, at least twice reminder was sent. Information obtained from respondents was held in strict confidence in all phases of the study. Total sample used for the study was 514. The sample size was decided based on respondent’s availability. Sampling method used for the study was non-probability convenience sampling. Research survey was carried out in Manipal, Karnataka, India. The study was conducted between August 2019 to December 2019. The survey instrument assessed pharmacy students’ in: (i) perceived knowledge and attitude on environmental education in general; and (ii) perceived knowledge and attitude of impact of environmental change on health. Chi-square tests were used to determine any statistical differences in responses between various student groups with *p* value of <0.5 deemed as significant.

**3. Results and Discussion**

**Table No. 1** Demographic characteristics of respondents (n=514)

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **D Pharm (n=45)** | **B Pharm (n=307)** | **M Pharm (n=65)** | **Pharm D (n=97)** | **Total (n=514)** | **p-value\*** |
| Gender  Male Female | 12 (27)  33 (73) | 118 (38)  189 (62) | 26 (40)  39 (60) | 29 (30)  68 (70) | 185 (36)  329 (64) | 1.132 |
| Age |  | | | | | |
| 18-24 | 45 (100) | 306 (99.6) | 63 (97) | 97 (100) | 511 (99) | 3.369 |
| 25-31 | 0 | 1 (0.4) | 2 (03) | 0 | 3 (01) |

Chi-square test was used. *\*p* = < 0.05 was considered significant.

From table 1 it was noted that total number of respondents used for the study was 514, 36% of respondents were male and 64% of respondents were female. 8.7% of respondents were from D. Pharm class, 59.7% were from B. Pharm, 12.6% were from M. Pharm and 18.8% were from Pharm D class. 99% of the respondents belong to 18-24 years of age group.

**Table No. 2** Respondents’ Knowledge and Attitude toward Environment Education [5][6][7][8]

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Questions** | **Answers (%) (n=514)** | | | | | |
| **Strongly agree** | **Agree** | **Neutral** | **Disagree** | **Strongly disagree** | **No Response** |
| Environmental science is one of  the important subject at school/college level | 264(51) | 85(17) | 73(14) | 43(8) | 49(10) | - |
| Environment is the most  important element of human life | 349(68) | 54(11) | 22(4) | 19(4) | 70(14) | - |
| Factors contributing to environmental damage or Climate change | | | | | | |
| *Excessive population growth* | 295(57) | 179(35) | 30(6) | 1(0.1) | 4(0.7) | 5(0.9) |
| *Deforestation* | 424(82) | 76(15) | 5(0.9) | 1(0.1) | 4(0.7) | 4(0.7) |
| *Carbon dioxide* | 312(61) | 154(30) | 33(6) | 2(0.3) | 3(0.5) | 10(1.9) |
| *Unsystematic waste management* | 376(73) | 114(22) | 6(1.1) | 2(0.3) | 4(0.7) | 12(2.3) |
| *Explosion tests of nuclear bomb* | 281(55) | 174(34) | 37(7) | 9(1.7) | 4(0.7) | 9(1.7) |
| *River pollution* | 394(77) | 101(20) | 9(1.7) | 0(0) | 4(0.7) | 6(1.1) |
| *Ozone depletion* | 366(71) | 120(23) | 14(3) | 1(0.1) | 4(0.7) | 9(1.7) |
| *Uncontrolled use of pesticides* | 330(64) | 146(28) | 16(3.1) | 3(0.5) | 4(0.7) | 15(2.9) |
| World Environment Day is celebrated on 5th June | 386(75) | 40(7.7) | 43(8.3) | 4(0.7) | 37(7.1) | 4(0.7) |
| It is the government's duty to  control air pollution, not the citizen's duty | 38(7.3) | 12(2.3) | 83(16.1) | 94(18.2) | 286(55.6) | 1(0.1) |
| Responsibility for environment protection lies on every person  individually | 402(78) | 54(10.6) | 23(4.4) | 10(1.9) | 22(4.2) | 3(0.5) |

Table 2 indicates that 51% of respondents are of opinion that environmental science was one of the important subject at school/college level. Syllabus related to environmental science is included at school level from first standard to college/university level, as it is made mandatory by respective governing authorities. Whereas 10% of respondents strongly disagree with the same. 68% of respondents felt that environment is the most important element of human life. 82% of the respondents strongly agreed, that deforestation is major factor for environmental damage or climate change. Expanding agriculture, due to an increased population and shifts in diet, is responsible for most of the world's deforestation [9]. Removal of trees from forests on large scale, damage to natural habitats and soil erosion are the other causes of deforestation. 77% of students strongly agreed regarding river pollution, as it is major cause of environmental problems, Rapid industrialisation development to support the increasing population and country's economy has poisoned rivers like never before. Studies have found that virtually all Indian rivers were polluted by domestic and industrial runoff and farm waste [10]. 73% of respondents felt that unsystematic waste management is another major factor, usually garbage can be used as valuable resource, if solid waste is recycled. Issues related to treatment of solid waste at community and household level need to be addressed. 71% of respondents strongly agreed said that ozone depletion is another factor, for cause of environmental problem. A depletion of the ozone increases the amount of UVB entering the earth's surface. Laboratory and epidemiological studies have found that UVB causes skin cancer and plays a major role in the development of malignant melanoma [11]. 64% of respondents strongly opined that uncontrolled use of pesticides has created this current problem. For decades’ different types of pesticides were used to safeguard crops. The crops benefit from pesticides; but, they also enforce a severe negative impact on the environment. Overuse of pesticides can lead to habitat destruction. 61% of the respondents strongly felt that carbon dioxide is another contributing factor, along with natural sources of CO2, man-made processes also create it. The main human contributions to the amount of carbon dioxide in the atmosphere are the burning of fossil fuels like coal, oil, and gas [12]. 57% of respondents strongly agreed to the statement, excessive population growth is one of the factor contributing to environmental damage or climate change. The impact of population growth on the environment has been thoroughly examined; it consists of resource depletion (agricultural land captured by urban expansion, soil depletion, deforestation, biodiversity loss, reduced mineral availability decreasing oil reserves) and resource degradation (air and water pollution) [13]. According to 55% of respondents said explosion tests of nuclear bomb is another cause of environmental problem. The indirect transfer of radionuclides into the geospheres and their accumulation in living cells, by way of the food chain, was yet another form of radioactive contamination of the marine and terrestrial ecosystems [14]. 75% of respondents were aware of world environment day. This is one of the significant positive observation among the respondents. 55% of respondents strongly disagreed with the statement, that it is only government's duty to control air pollution, not the citizen's duty. Further 78% of respondents felt that it is responsibility of every individual to protect environmental damage.

**Table No. 3** Respondents’ Knowledge and Attitude toward Impact of Environmental Change on Health

|  |  |
| --- | --- |
| **Question** | **Total (n=514)** |
| Do you know about environmental climate change and its?  impact on health? |  |
| No | 12(2.3) |
| Yes, my source of information is - Electronic mass media | 271(52.7) |
| Newspapers | 74(14.3) |
| School/College | 139(27) |
| Friends/ Neighbors | 5(0.9) |
| No opinion | 13(2.5) |
| In recent times environmental climate change has an impact on  human health |  |
| Strongly agree | 359(70.4) |
| Agree | 94(18.4) |
| Neutral | 26(5.1) |
| Disagree | 13(2.5) |
| Strongly disagree | 18(3.5) |
| No opinion | 4 |
| Is your College/ University concerned about the prevention of  health impacts due to climate change |  |
| No opinion | 4(0.7) |
| Yes | 339(66) |
| No | 49(9.5) |
| Not aware | 122(23.7) |
| As an individual, I can protect environmental damage by |  |
| No opinion | 8(1.5) |
| Reduce emission of polluting gas | 56(10.8) |
| Use of cleaner energy systems | 38(7.3) |
| Promoting the safe use of public transportation | 51(9.9) |
| Buying eco-products | 96(18.6) |
| Avoid use of plastics | 189(36.7) |
| Participate in environmental related activities at School/  College/ University level | 59(11.4) |
| Can't say / Not sure | 17(3.3) |

Table 3 states about respondents’ knowledge towards environmental change on health. For 52.7% of respondents, source of information related environmental climate change and its impact on health is through electronic mass media. For other respondent’s, source of information was through school/college (27%). According to 70.4% of respondents, change in environmental climate have affected human health. 66% were aware of their college/ university, which were involved in environmental protection. They felt that college/ university is concerned about the prevention of health impacts due to climate change. 23.7% of respondents were not aware about the same. Further question was posed to know, as an individual, how can they protect environmental damage in future. 36.7% of respondents said they will avoid use of plastics. However, there are four major options for disposal of plastics: landfilling, incineration, recycling, and biodegradation [15]. 18.6% of respondents have made up their mind to buy eco-friendly products from the market. Eco friendly products can be disposed easily after use. These products are environmental friendly. Uses of ecofriendly products helps in reducing waste, can be reused, refilled and recycled. As per 11.4% of respondents are willing to participate in environmental related activities at school/ college/ university level for awareness campaign. 10.8% of respondents said they may reduce emission of polluting gas. 9.9% of respondents want to use and promote the safe use of public transportation. According to 7.3% of respondents want use of cleaner energy systems. There are many positive impacts of clean energy, including the benefits of wind, solar, geothermal, hydroelectric, and biomass. Environmental health, as defined by WHO, comprises those aspects of human health, including quality of life, that are determined by physical, chemical, biological, social, and psychosocial factors in the environment. It also refers to the theory and practice of assessing, correcting, controlling, and preventing those factors in the environment that adversely affect the health of present and future generations. Our environment (climate/weather) affects health in a variety of ways.

**Table No. 4** Respondents’ Knowledge Towards different health effect due to climate change (Ranked based on severity) [16]

|  |  |
| --- | --- |
| **Questions** | **Total (n=514)** |
| Different health effect due to climate change |  |
| Malnutrition | 129(25) |
| Malaria | 150(29.1) |
| Diarrhea | 138(26.8) |
| Heat stress | 175(34) |
| Asthma | 178(34.6) |
| Allergies | 183(35.6) |
| Mental disorders | 98(19) |
| Communicable diseases | 143(27.8) |
| Water-borne diseases | 187(36.3) |
| Hearing loss | 111(21.5) |

Table 4 indicates about respondents’ knowledge about various health effects caused due climate change. The responses were ranked based on severity. Water-borne diseases was ranked highest in terms of percentage 36.3% of respondents ranked as one of the major cause due to climate change. These are caused by dirty water contaminated by animal and human waste, especially from urban sewage, or by agricultural and industrial chemical waste. Some of those diseases cause severe outbreaks, such as cholera and typhoid. Diarrhoea, dysentery, polio, meningitis and hepatitis A and E. Improving hygiene and providing treated potable water lowers these diseases prevalence. As per 35.6% of respondents felt that different types of allergies may occur due climate change. According to 34.6% of respondent’s asthma diseases is on rise due to climate change. High-density city traffic leads to an increase in respiratory diseases like asthma. Heat stress is another major health issue due to climate change according to 34% of respondents. In certain limitations human physiology can adjust to changes in weather. But, marked short-term weather variations lead to severe health issues. The heat waves cause illness and death pertaining to heat (e.g. heat stroke). In India in 1998 heatwaves were associated with numerous deaths. According to 29% of respondents stated that malaria disease is on rise due to recent climate change. Malaria has come back today, and is found throughout the world's tropical and subtropical parts. Parasites of malaria develop dangerous levels of drug-resistance. As per 27.8% of respondents stated about rise in various communicable diseases due to climate change. Diarrhea is another major health issue, according to 26.8% of respondents. Every year millions of children die from contaminated water or food due to diarrhoea. These diseases affect an estimated 2,000 million people, and more than 3 million children die from diseases worldwide each year. In India every fifth child under the age of 5 is estimated to die from diarrhoea. Malnutrition is another health issue according to 25% of respondents. Even though malnutrition is rarely listed as the direct cause of death, it leads approximately half of all deaths in children. Lack of access to food, poor feeding practices and infection or a combination of the two constitute major mortality factors [17]. Some other health issues stated were hearing loss (21.5%) due to noise pollution and (19%) related to mental disorders. One of the major limitation of the study was it was conducted only in one college, however, it can be considered as a pilot study. A national level study with larger random sample of students from entire India would give more insights to the said topic.

**4. Conclusion**

The study results revealed that the participating pharmacy students are aware of environmental education and related issues. The study also implicates that environmental science is one of the important subject at school/college level. The study also revealed that pharmacy students being most positive towards to participation in environmental related activities at school/ college/ university level. Respondents are very much aware of different health issues, caused due climate change. As an individual, they are ready to protect environmental damage by avoiding use of plastics. Electronic media is major source of information about environmental climate change and its impact on health. However, awareness and knowledge related environmental education and impact of environmental change on health need to be assessed and provided to students from time to time.

**5. Conflict of interest**

No

**6. References**

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