

Usage of Plastic Bags and Health Hazards: A Study to Assess Awareness Level and Perception about Legislation Among a Small Population of Mangalore City

NITIN JOSEPH¹, ASWIN KUMAR², SUMANTH MALLIKARJUNA MAJGI³, GANESH S KUMAR⁴, RAGHAVENDRA BABU YELLAPUR PRAHALAD⁵

ABSTRACT

Introduction: Plastic bag users are at risk of number of health hazards. There is paucity of data with regard to awareness of health hazards among general population in India.

Aim: This study was done to find out the status of awareness of the health hazards associated with the usage of plastic bags among people and their perception towards the legislation prohibiting the usage of plastic bags.

Materials and Methods: This cross-sectional study conducted in Mangalore city in August 2013. Data was collected by interviewing any adult member (aged above 18 years) in each of the selected households using an interview schedule.

Results: Mean age of the 250 participants was 32.8±10.8 years. Majority 160(64%) were females educated up to undergraduate level or above 187(74.8%). Among the participants 216(86.4%) were aware of the health hazards associated with the use of

plastic bags. Awareness was significantly more amongst females ($p=0.027$), well-educated participants ($p=0.004$) and among professionals and semi-professionals ($p<0.001$). There were 50(20%) participants reusing plastic bags for shopping after initial usage. The cloth bags were used for shopping in place of plastic bags by 13(5.2%) participants. Among the participants 213(85.2%) were aware of the legislation banning the use of plastic bags and out of which 166(77.9%) were in its favour. Semi-professionals and students favoured the ban on plastic bags whereas unskilled and semiskilled workers were against the ban ($p=0.01$).

Conclusion: Most of the participants in the settings had the awareness of hazards of plastic bag usage. However, there is a need for spreading the awareness of using alternative strategies and effective implementation of legislation in order to minimize the usage of plastics in the community.

Keywords: Attitude, Health problems, Knowledge, Plastic items, Regulations, Urban area

INTRODUCTION

Plastic industry is one among the rapidly growing industries in India. The production of plastics has reached 8.5 million tons in 2013 with a growth rate of 8% over the previous five years. The growth rate is expected to be 10% over the next five years [1]. The reasons for popularity for using the plastic bags are light weight, resistance to degradation (by chemicals, sunlight and bacteria), durability and above all low cost.

While these conveniences are benefitting individual users, the problems and the cost of disposal of plastic items would burden the entire society [2]. After their entry to environment, plastics take anywhere from 15 to 1000 years to biodegrade [3]. It poses a risk to human health and environment [4]. In addition to problems like choking the drains, the littered plastic bags are breeding ground for mosquitoes when rain water gets collected in them. This could worsen the situation of malaria in a highly endemic area like Mangalore city.

Plastic bag packing for hot edible items causes migration of harmful chemicals to food items. These include Styrene which is carcinogenic, Phthalates and Bisphenol A which causes diabetes and diseases of the heart and liver [5]. Therefore, it is high time we switch over to alternative materials for packing and transportation.

“The Plastic Manufacture, Sale and Usage Rules 1999, amended in 2003 under the Indian Environment (Protection) Act of 1986 prohibit manufacture, stocking, distribution or sale of carry bags made of virgin or recycled plastic and prohibits littering of plastic items” [2].

However, studies on consumer preferences revealed that large proportion of people do not value environmental aspects [6]. Moreover, poor enforcement of the legislation has made the ban

towards plastic bags usage largely ineffective [2]. The result being plastic bags have been used widely by small business owners like hawkers, retail shops and in shopping malls. With this background, this community based study was done in Mangalore, a fast growing city in Karnataka state, to find out the pattern of usage of plastic bags on a daily basis and to analyse the reasons for popularity of plastic bags among users. The study also assessed the awareness about the health hazards associated with plastic bag usage among the people and their perception towards the legislation banning the usage of plastic bags.

MATERIALS AND METHODS

This cross-sectional study was undertaken in August 2013 in the field practice area of Urban Health Training Centre in Lady Hill area of Mangalore city in southern India. Institutional ethics committee approved for conducting this study.

The sample size of 250 was calculated using 95% confidence limits, 85% power and assuming the usage rate of plastic bags to be 40% as reported in another Indian study [7]. These households were selected by systematic random sampling method from a total of 12,389 households with a population of 58,321 residing in Lady Hill area of Mangalore city. If a house was found locked during the visit, the investigators visited the adjacent house for collecting the data. Data was collected by interviewing any one adult member (aged above 18 years) in the household using a pretested structured interview schedule. The pilot testing of the schedule was done among ten non-randomly chosen participants before the start of the study. A written informed consent was taken from each participant. Socio-demographic information viz., age, educational status and occupational status were enquired from each participant.

Questions regarding frequency of usage of plastic bags and what do they do or how do they dispose the bags after every usage were asked. They were also enquired about what they felt was the reason for popularity of plastic bags, whether they were habituated in demanding the bags more than the actual requirement from shop keepers or whether the shop keepers generously offered them the bags without checking their actual requirements and whether they were habituated in reusing plastic bags by carrying own bags for shopping visits. The questions on their awareness regarding hazards and types of hazards associated with plastic bag usage, awareness about recyclable plastic bags, awareness on eco-friendly alternate material for making bags and awareness about the legislation which bans usage of plastic bags and their opinion regarding the ban on usage of plastic bags were also included. If they voiced against the legislation, what was the reason for the same was enquired.

STATISTICAL ANALYSIS

Data was entered and analysed using version 16.0 of the Statistical Package for Social Sciences software package (SPSS Inc., Chicago, IL). Chi-square test was used to test association and p-value <0.05 was considered as significant association.

RESULTS

Mean age of 250 participants was 32.8±10.8 years. Majority of them 160(64%) were females and also the majority 187(74.8%) were educated up to undergraduate level or above. Among the participants 216(86.4%) out of 250 were aware of at least one health hazard of plastics. Out of these 216 participants, 177(81.9%) knew that plastics are non-biodegradable and 50(23.1%) knew that plastic contained carcinogenic substances. Awareness level about the hazards associated with usage of plastics was significantly more among females ($p=0.027$), participants educated till graduation or above ($p=0.004$) and among professional and semi-professionals ($p<0.001$) [Table/Fig-1].

There were 50(20%) participants reusing the plastic bags for shopping after usage and out of these 50 participants 33(20.6%)

Age group	Aware (%)	Not aware (%)	Total	χ^2 value, DF*, p-value
≤ 20 years	14(73.7)	5(26.3)	19	
21-30 years	86(88.7)	11(11.3)	97	
31-40 years	66(84.6)	12(15.4)	78	
>40 years	50(89.3)	6(10.7)	56	3.64, 3, 0.303
Gender				
Male	72(80)	18(20)	90	
Female	144(90)	16(10)	160	4.9, 1, 0.027
Educational status				
Up to SSLC [†]	13(65)	7(35)	20	
PUC [‡]	34(79.1)	9(20.9)	43	
Graduate	121(89)	15(11)	136	
Post graduate	48(94.1)	3(5.9)	51	13.1, 3, 0.004
Occupational status				
Housewives	98 (91.6)	9 (8.4)	107	
Students	12 (85.7)	2 (14.3)	14	
Skilled workers	30 (73.2)	11 (26.8)	41	
Semi-skilled/ Unskilled workers	4(36.4)	7(63.6)	11	
Semi-professionals/ Professionals	72(93.5)	5(6.5)	77	35.3, 4, < 0.001
Total	216	34	250	

[Table/Fig-1]: Associating the awareness on hazards due to the usage of plastic bags with various socio-demographic variables.

* Degrees of freedom

† Secondary School Leaving Certificate

‡ Pre University Course

Age group	In favour of ban (%)	Not in favour of ban (%)	Total	χ^2 value, DF*, p-value
≤ 20 years	14(87.5)	2(12.5)	16	
21-30 years	58(69.9)	25(30.1)	83	
31-40 years	52(77.6)	15(22.4)	67	
>40 years	42(89.4)	5(10.6)	47	7.56, 3, 0.056
Gender				
Male	55(74.3)	19(25.7)	74	
Female	111(79.9)	28(20.1)	139	0.859, 1, 0.354
Educational status				
Up to SSLC/ PUC	39(76.5)	12(23.5)	51	
Graduate	91(78.4)	25(21.6)	116	
Post graduate	36(78.3)	10(21.7)	46	0.084, 2, 0.959
Occupational status				
Housewives	62(72.1)	24(27.9)	86	
Students	8(88.9)	1(11.1)	9	
Skilled workers	28(75.7)	9 (24.3)	37	
Unskilled/ Semi-skilled workers	4(44.4)	5(55.6)	9	
Semi-professionals/ Professionals	64(88.9)	8(11.1)	72	13.3, 4, 0.01
Total	166	47	213	

[Table/Fig-2]: Associating the perceptions towards the ban on plastic bag usage with various socio-demographic variables.

were females and 17(18.9%) were males ($\chi^2=0.109$, $p=0.742$). Three (1.2%) participants were littering the plastic bags in open areas after usage and 197(78.8%) participants used to dispose plastic bags in bins. Among the users 138(55.2%) felt that plastic bags were popular among customers because of their easier availability, 111(44.4%) due to their durability such as ease in carrying liquid items and 42(16.8%) for they were light weight. The 179(71.6%) participants were aware of the fact that the plastic bags were recyclable. The alternatives for plastic bags suggested by users were jute bags 76(30.4%), biodegradable plastic bags 65(26%) and paper bags 53(21.2%). Only 13(5.2%) participants were using cloth bags for shopping in place of plastic bags. As many as 48(19.2%) participants had the habit of demanding more plastic bags from the shop keepers. Among the participants, 206(82.4%) stated that the shop keepers handed them plastic bags after their purchase without even asking them if they really required more bags for carrying goods.

Out of the total, 213(85.2%) were aware of the legislation banning the use of plastic bags and of whom, 166(77.9%) participants responded in favour of the legislation. Out of the participants, 47(22.1%) were against the legislation. The most common reason for opposition stated by 33(70.2%) participants was inconvenience caused while shopping. Occupational status was found to significantly influence the perception towards the legislation on prohibiting the usage of plastic bags ($p=0.01$). No other socio-demographic variables like age, gender or educational status was found to influence the perception towards the legislation for prohibiting the usage of plastic bags [Table/Fig-2].

DISCUSSION

Majority of the subjects (86.4%) in this study was aware of at least one health hazard of plastics. This was better than the observations found in studies conducted in India and other parts of the world where 50% to 81.1% participants were aware of associated health hazards [3,5,8,9].

In a Delhi based study, 74.5% housewives and 81.5% professionals were aware of health hazards associated with the usage of plastics and it was lower than our observations [8]. However,

the awareness among students (93%) and lower income groups (52%) in the Delhi based study was more than our observations [8]. Awareness of students is very vital for any awareness campaign. Students by means of their academic curriculum are expected to be knowledgeable on various public health issues concerning the society which includes hazards of plastic bag use. They can hence play a productive role in health education activities in the community. This would help the government and non-government organizations by avoiding extra financial burden to train the additional personnel [8]. Poor awareness among people in general has been reported as the leading cause in developing countries resulting in adopting environmentally unfriendly practices [2]. The various means to enable easy availability of information should support awareness generation initiatives. For example, display of banners with the intention of creating awareness on the use of alternative bags could be an effective low cost information strategy. Pamphlets on hazards of plastic bags need to be put up near check-outs or cash counters in grocery stores and shops. Radio and television can also help in mass dissemination of information. This will motivate both adults and children to use alternate eco-friendly bags like paper or cloth bags [3,8]. The commonest reasons for preferring plastic bags found in this study were the easy availability followed by durability. This was similar to the findings of the study done in Delhi where convenience for shopping was the commonest reason stated by most participants [8]. Another study done in an urban area of Ethiopia reported that low price, easy availability and light weight were the main reasons for popularity of plastic bags amongst its users [9].

In this study very few participants were littering the plastic bags in open areas after usage. The Ethiopian study [9] reported 59.6%, a study done in Dholpur town, Rajasthan [7] reported that 40% and in another study done in Tiruchirapalli City, Tamil Nadu [10] reported that 43.1% participants used to litter plastic bags in open. The lower litter rate in this study could be because of better awareness about the hazards of plastic bags compared to other studies on issues like non-biodegradable nature of plastic bags among people.

In this study, 20% of participants were reusing plastic bags after usage. This was similar to the findings of a study done in California, USA where 18.9% participants were using reusable bags [3]. In another study done in Delhi only 4.6% of participants used to carry own plastic bags for shopping. The above study also reported that among the people who used to get their own bags, the proportion of females 11.9% using reusable bags was more than males 9.7% and it was similar to our findings [2].

Gupta K et al., reported that 89% of consumers admitted that they started imitating others who were carrying own bags for shopping [2]. This was like setting a good example for others for minimizing plastic bag utilization.

Even though reusing of plastic bags leads to less generation of waste this strategy has been framed as unhygienic. Studies have found that 97% of shoppers have been reusing plastic bags in Los Angeles, San Francisco and Tucson, USA without washing them. These reusable bags carried harmful bacteria which cause cross-contamination of food packed in it, thereby threatening human health [3]. There have been reports of *Escherichia Coli* identified in 8% of reused bags along with several enteric bacteria and other opportunistic pathogens in a recent study by Williams DL et al., [11].

Hence, if reusing bags is to be promoted as a strategy to minimize the utilization of plastic bags then the periodic washing of the bags should also be made mandatory for the customers.

The alternatives for plastic bags like jute bags and paper bags were suggested by a few participants in this study. In another study done in Delhi 57.6% users suggested cloth/ jute as alternatives for plastic bags while 40.3% suggested paper bags [8]. The other alternatives

could be polypropylene bags, biodegradable bags made of cornstarch and sisal bags, which are quite durable and hence can also be reused.

Even though most consumers were aware of the hazards associated with the usage of plastic bags and some of them even had an idea of alternative eco-friendly bags, hardly 5% participants in the present study were using eco-friendly bags. This was much lesser than the observations of a study done in California, USA where 30.2% were using the paper bags [3]. Hence, provision of suitable bags like cloth/jute/ paper bags in market places at a subsidized price would improve the practice if the customer forgets to get one from home. This strategy has been reported to reduce the utilization of plastic bags by 90% in Ireland [12] and by 49% in China [13].

In this study 14.8% participants were unaware of the legislation banning the usage of plastic bags. The shop keepers, on the other hand, were supplying plastic bags to their customers without even verifying whether they actually needed them. Similar observations were made in a study conducted in Delhi where some stores repeatedly violated the government ban by providing plastic bags generously [2]. This highlights the ignorance of citizens, both shop owners and consumers, about the legislation and ineffectiveness of awareness campaigns in disseminating information on penalties imposed under this legislation.

On the other hand, Xing X et al., observed that following the implementation of ban on free plastic bags in China, the use of plastic bags reduced dramatically and so also improved the public awareness of environmental protection [14].

In the present study although most participants were aware of the legislation, about one fourth were not in favour of the ban on plastic bags. Majority of these people who opposed the ban on plastic bag usage were unskilled and semi-skilled workers followed by housewives. This was similar to the findings of another study done in Delhi where 76% housewives and 53% low income group members were against the ban on plastic usage [8]. Most housewives even though were aware of health hazards of plastic bags, were not favouring the ban on these products as they were used to comforts of plastic bags. A study done in Ethiopia also reported that majority of female participants wanted to continue using plastic bags in spite of being aware of their health hazards [9]. If the low socio-economic groups are opposing the ban it could be because of ignorance about the hazards of using the plastic bags. Most people who favoured ban were semi-professionals, professionals and students. Similarly, in the study done in Delhi, 62% students and 42% institutional members supported the ban on plastic carry bags [8]. The favourable attitude towards the legislation seen among a good number of students could be a result of constant education campaigns at schools on environmentally sensitive issues [2].

The participants aged above 40 years and those below 21 years favoured the ban on plastic bags. This was similar to the findings of the Delhi based study which suggested that the youngsters and the elderly were more conscious or receptive to environmental health issues [2].

LIMITATION

The finding of this study is limited to one ward and hence cannot be generalized to entire Mangalore city.

CONCLUSION

Most of the participants in the settings had the awareness of health hazards of the usage of plastic bags and supported its ban. However, practices with respect to usage of alternative bags or reuse of already used bags were found poor among majority of the participants. Awareness generation on these strategies and effective implementation of legislation may help in reducing the usage of plastic bags in the community.

ACKNOWLEDGEMENTS

We authors like to thank MBBS students Ms. Samudyata M Heroor, Mr. Swaroop, Ms. Hasini Kanchana Perera, Mr. Arpit Govil, Mr. Kaushik H Mahadik, Ms. Shravya U and Mr. Ankit Poddar of Kasturba Medical College, Mangalore, India for their help in data collection. We also thank Dr. Maria Nelliyanil, Assistant Professor, Department of Community Medicine, A.J Institute of Medical Sciences, Mangalore for her help in data analysis.

REFERENCES

- [1] Federation of Indian Chambers of Commerce and Industry. A report on plastics industry [Internet]. New Delhi: TATA Strategic Management Group; 2014. [cited 2014 Nov 2] Available from: <http://www.ficci.com/spdocument/20396/Knowledge-Paper-ps.pdf>
- [2] Gupta K, Somanathan R. Consumer response to incentives to reduce plastic bag use: Evidence from a field experiment in urban India [Internet]. Delhi: Delhi School of Economics; 2011 Nov [cited on 2014 Jan 24]. Available from: http://www.isid.ac.in/~pu/conference/dec_11_conf/Papers/KanupriyaGupta.pdf
- [3] Sutton J, Turner B. Plastic bags: Hazards and mitigation [Internet]. California: Social sciences department, California Polytechnic State University; 2012 May [cited on 2014 Jan 27]. Available from: <http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1082&context=socssp>
- [4] Halden RU. Plastics and health risks. *Annual Review of Public Health*. 2010;31:179-94.
- [5] Sung GB. Ban on plastic bags usage: Is it a right move? An empirical study on consumer perception and practice [Dissertation]. Gelugor; Universiti Sains Malaysia; 2010.
- [6] Hopewell J, Dvorak R, Kosior E. Plastics recycling: challenges and opportunities. *Philos Trans R Soc Lond B Biol Sci*. 2009;364:2115-26.
- [7] Singh MK, Devi SR. Hazards of Plastic Bags in Dholpur - A Small District town of Rajasthan, India. *Int. Res. J. Environment Sci*. 2013;2:6-10.
- [8] Abhigyan. Use of plastic bags: factors affecting ecologically oriented behavior in consumers [Internet]. Delhi: Foundation for Organisational Research and Education; 2008 Oct-Dec. [Cited on 2014 Feb 19]. Available from: <http://www.freepatentsonline.com/article/Abhigyan/192438179.html>
- [9] Adane L, Muleta D. Survey on the usage of plastic bags, their disposal and adverse impacts on environment: A case study in Jimma City, Southwestern Ethiopia. *Journal of Toxicology and Environmental Health Sciences*. 2011;3:234-48.
- [10] Rajkumar P. A Study on the Plastic Waste and Environmental Degradation. *ABC Journal of Advanced Research*. 2015;4:9-15.
- [11] Williams DL, Gerba CP, Maxwell S, Sinclair RG. Assessment of the Potential for Cross-contamination of Food Products by Reusable Shopping Bags. *Food Protection Trends*. 2011;31:508-13.
- [12] Convery F, McDonnell S, Ferreira S. The most popular tax in Europe? Lessons from the Irish plastic bags levy. *Environ Resource Econ*. 2007;38:1-11.
- [13] He H. The effects of an environmental policy on consumers: lessons from the Chinese plastic bag regulation [Internet]. Sweden: School of Business, Economics and Law, University of Gothenburg; 2010 Jun [Cited on 2014 Mar 1]. Available from: https://gupea.ub.gu.se/bitstream/2077/22459/1/gupea_2077_22459_1.pdf
- [14] Xing X. Study on the Ban on Free Plastic Bags in China. *Journal of Sustainable Development*. 2009;2:156-58.

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Community Medicine, Kasturba Medical College, Manipal University Mangalore, India.
2. Assistant Professor, Department of Community Medicine, S.S Institute of Medical Sciences and Research Centre, Davangere, India.
3. Assistant Professor, Department of Community Medicine, Mysore Medical College, Mysore, India.
4. Associate Professor, Department of Community Medicine, J.I.P.M.E.R., Puducherry, India.
5. Associate Professor, Department of Forensic Medicine, Kasturba Medical College, Manipal University, Mangalore, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Nitin Joseph,
Associate Professor, Department of Community Medicine, Kasturba Medical College,
Manipal University Mangalore-575001, India.
E-mail: drnitinjoseph@gmail.com

FINANCIAL OR OTHER COMPETING INTERESTS: None.

Date of Submission: **Aug 13, 2015**
Date of Peer Review: **Oct 14, 2015**
Date of Acceptance: **Dec 22, 2015**
Date of Publishing: **Apr 01, 2016**