

Detergent Use Practices in Nepal: A Cross-Sectional Online Survey

**Saraswati Kumari Joshi¹, Nisha Adhikari², Shristi Joshi³, Sita Kumari Joshi¹,
Durga Kumari Joshi¹, Ravin Bhandari⁴ and Dirgha Raj Joshi^{5*}**

¹Kailali Multiple Campus, Campus Road, Dhangadhi, Kailali, Nepal.

²College of Pharmacy, Gachon University, Incheon, Republic of Korea.

³School of Engineering, Pokhara University, Kaski, Nepal.

⁴Department of Pharmacy, Crimson College of Technology, Butwal, Nepal.

⁵College of Pharmacy, Yonsei University, Incheon, Republic of Korea.

Authors' contributions

This work was carried out in collaboration among all authors. Authors SKJ and NA contributed equally. Author DRJ designed the study, supervise it and wrote the manuscript. Authors SKJ and NA equally involved in literature review and actively involved in data collection and arrangement. All other authors involved and help in these process. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CJAST/2020/v39i3631079

Editor(s):

- (1) Dr. Ashish Anand, GV Montgomery Veteran Affairs Medical Center, USA.
(2) Dr. Yahya Elshimali, Charles Drew University of Medicine and Science, USA.

Reviewers:

- (1) Prem Kumar, BMS, School of Commerce, Jain (Deemed-to-be University), India.
(2) V. Vijaya Lakshmi, India.

Complete Peer review History: <http://www.sdiarticle4.com/review-history/62694>

Original Research Article

Received 20 September 2020

Accepted 27 November 2020

Published 04 December 2020

ABSTRACT

Every year the use of detergent is increasing and safety concerns about detergent are also increasing. However, in developing countries safety concerns about detergent is still a neglected topic. Therefore, the purpose of this study is to evaluate the knowledge, attitude, and practices (KAP) of the general public towards the use of detergent. An online-based cross-sectional study was performed via sharing self-developed online KAP questionnaires and filled out by participants. The basic knowledge about detergent, its safety concern, and other related questions were used for the KAP assessments. A total of 510 participants took part in this study. The participants had mixed responses to the questions such as; [1] the majority were using powder detergent (87.45%); [2] perceptions about detergent (an agent for cleansing clothes (48.04%), a chemical agent (39.02%)); [3] the purpose of using detergent (to remove dirt (48.04%), for easiness of cleaning (45.1%)); [4]

*Corresponding author: E-mail: djmeropaila121@yonsei.ac.kr, djmeropaila121@gmail.com;

the cost of detergent (affordable (80%), expensive (10.98%)); [5] the selection of detergent (based on previous satisfaction (60.98%), brand name (19.02%)); [6] cause of not using particular brand detergent next time is (poor quality (75.1%), expensive (18.04%)); [7] mostly used brands (Wheel (35.69%), Ghadi (16.08%) and Patanjali (7.06%)); [8] safety concerns (only 8.82% used gloves during using detergent and only 50% realized the detergent can harm their skin, 67.84% have awareness that the detergent contaminates the environment, 10% experienced dryness of skin, 0.98% redness/allergy); [9] 77.06% don't have a washing machine; [10] soaking practice (21.37% start washing immediately after the addition of detergent, only 32.16% soak clothes for 20 to 60 minutes); [11] waste water management (80.4% throw the detergent waste water to the normal sewage, 19.6% throw separately); [12] 37.45% always use soap along with powder detergent while washing clothes; [13] detergent stability problem (absorb moisture and get wet easily (64.31%) color change (16.08%) and dryness (10.78%)); [14] 28.63% prefer colorful detergent and 42.94% observed the color transfer from detergent to clothes; only 37.45% have experience of using herbal detergent; [15] laundry detergent also used for other purposes (wash dishes (19.61%), to wash hands (5.49%) and even body washing (1.76%)); [16] 19.61% of the participants' mothers wash their clothes; [17] the majority of the participants realized the dirtiness of country people is due to poverty (58.04%). This study shows moderate awareness regarding the KAP of detergent use, management, and toxicity. Therefore, it can be derived that continuous education is needed about detergent.

Keywords: Detergent, toxicity, cleansing agents, laundry, online survey.

ABBREVIATION

KAP: Knowledge; Attitude and Practice

1. INTRODUCTION

Detergent is an agent used to make easiness in cleaning [1]. Its uses are diverse, such as using it in the kitchen, for laundry, and for other purposes in the industry [2,3]. From the time of human civilization some form of detergent has been used including soil, ash, or some plant-derived sources. Detergent can be a contaminant to nature. With the increasing use of detergent day by day there are rising concerns about it. One big concern is the contamination of nature (including flora and fauna) by using detergent [4]. Most of the detergent can be degraded by aerobic processes but due its toxicity and restricted metabolic pathway the anaerobic degradation is less possible. So the production, distribution, and handling of environmentally-friendly detergent is highly demanded throughout the world [4]. A review by Mousavi and Khodadoost was discussed in detail about the "effects of detergent on natural ecosystem and waste water treatment processes". It includes the effects of detergent on aquatic ecosystem (fish, fungi, plant), soil ecosystem (bacteria, sewage treatment, aerobic process) [4]. In developed nation the safety concern about detergent to the environment, water and human are widely discussed and researched topic from long time

[5-8]. Like in Scotland, in 1953 they made a committee "to examine and report on the effects of the increasing use of synthetic detergents and to make any recommendations that seem desirable with particular reference to the functioning of the public health services" [9]. Several scientific discussion held in early time about detergent, like in 1937 "Scientific and Technical Aspects of Wetting and Detergency", held at the Imperial College of Science [10]. The "Journal of Surfactants and Detergents" published by American Oil Chemists' Society (AOCS) is publishing "scientific contributions in the surfactants and detergents area" [11]. Although detergent use is rapidly growing in Nepal, the safe handling and management of detergent contaminated water and other safety concerns related to it are very limited. There has been no scientific study performed yet in Nepal and to the best of our knowledge only one study about the "effects of detergent use on water quality in Kathmandu, Nepal" has been performed [12]. As part of our ongoing efforts about organic solvent's toxicity [13], diversified use of cow related products [14,15], use of salts in synthesis [16], and green chemistry concept [17], we deduced and reasoned the importance of this survey to know the overall KAP of general public towards detergent, as this is the first survey conducted about the KAP of detergent use in Nepal. We hope this will alert all concern bodies to act on detergents use, safety, export, import, waste management and greener concept on it.

2. METHODS

We performed an online based cross-sectional study via sharing (Facebook, messenger). This self-developed online KAP questionnaires used Google forms and was filled out by participants. Participants took part completely voluntarily. We received their agreement of consent and only surveyed participants aged 20 or above. The basic knowledge about detergent, its safety concern, and other related questions were used for the KAP assessments. The CHERRIES (Checklist for reporting results of internet E-surveys) guidelines were followed to conduct this survey [18]. A total of 510 responses are received from June 15 to August 18, 2020. Finally the data was arranged in Excel and further analyzed.

3. RESULTS

A total of 510 participants took part in this survey. The participants' demography is shown in Table 1. And the specific question responses by participants are shown in Table 2. The participants' ages range from 20 to above 40 years. In total, 72.94% are male, 18.04% are unemployed, and 30% are dependent on others for source of income. Among the participants, the majority thinks that detergent is an agent to clean clothes (48.04%) followed by chemical (39.02%). The purpose of detergent use is to remove dirt (48.04%), for easiness of cleaning (45.1%). The majority says the cost of detergent is affordable (80%) and only 10.98% realized it is expensive. During the selection of detergent the majority consider the previous satisfaction (60.98%) followed by brand name (19.02%). Most of the participants are using powder detergent (87.45%) followed by liquid detergent (10.59%). The cause of not using particular detergent next time is due to quality issue (75.1%) followed by price (18.04%). Most of the participants used detergent brand Wheel (35.69%), then Ghadi (16.08%), and Patanjali (7.06%). 48.23% think the Indian brand detergent is good and 37.45% prefer the Nepalese brand. Only 8.82% use gloves while using detergent and only 50% realized the detergent can harm their skin. Regarding the dryness/allergic response of using detergent; 89.02% don't have any problem, 10% experienced dryness of skin, and 0.98% experienced redness/allergy. The majority of the population doesn't have a washing machine (77.06%). The clothes' soaking time varies as 21.37% start washing immediately after the addition of detergent and only 32.16% soak

clothes for 20 to 60 minutes. The majority throw the detergent waste water into the normal sewage (80.4%) but 19.6% pour it out separately. Regarding the harm caused by detergent to the environment, 67.84% are aware that detergent can contaminate the environment, 25.1% have no idea about it, and 7.06% don't think that detergent can harm the environment. While washing clothes, 37.45% always use soap along with powder detergent for better cleaning. The most observed stability problem is: absorb moisture and get wet easily (64.31%) followed by color change (16.08%) and dryness (10.78%). Only 28.63% prefer color detergent and 42.94% observed the color transfer from detergent to clothes. 77.06% are looking for a new company to manufacture a good quality detergent. Only 37.45% have the experience of using herbal detergent. Along with washing clothes, the laundry detergent is also used for other purpose like: to wash dishes (19.61%), to wash hands (5.49%) and even to wash their bodies (1.76%). In total, 19.61% of the participant's mothers wash their clothes; on the other hand, none of the participants' fathers wash their children's clothes. The majority of the participants realized that the dirtiness of country people is due to poverty (58.04%).

4. DISCUSSION

Every year the amount of detergent use and its market is increasing [19]. The detergent is a mixture of chemicals and those chemicals may affect our body and our environment [20]. Thus the study on the KAP towards detergent use is needed and we selected Nepal. Our study shows mixed response of the KAP of detergent use. The detergent is a chemical agent and the primary purpose of using detergent is to clean clothes with easiness [1], the similar response from the participants as well. As the reasonable price of detergent is important [21], the majority says the cost of detergent is affordable (80%) and only 10.98% realized it is expensive. The satisfaction of detergent lies on its quality, reasonable price, good packaging, safety for health and environment etc [22,23]. This is expressed by the respondents as, during the selection of the detergent the majority consider the previous satisfaction (60.98%) followed by brand name (19.02%). Throughout the world the growth of using liquid detergent is rapidly increasing [24], in Nepal also growing but still the majority of the participants were using powder detergent (87.45%). We realized this is due to long practice habit and powder detergent is

better to remove mud out. [1] The poor quality of products makes the consumers disappointed and decides not to use the detergent again (75.1%). The safe use of detergent is important [25] but in this study only 8.82% use gloves while they use

detergent and only 50% realized that detergent can harm their skin. This may be why the participants experienced dryness of skin (10%) and redness/allergy (0.98%) [26].

Table 1. Participants' characteristics

Category (question and response)	Number(n=510)	Percentage (%)
1. Age (years)		
20-25	245	48.04
26-30	148	29.02
31-40	107	20.98
Above	10	1.96
2. Gender		
Female	138	27.06
Male	372	72.94
3. Income source		
Self-stand	265	51.96
Dependent	153	30.0
Unemployed	92	18.04

Table 2. Shows the participants response towards detergent use practices

Category (question and response)	Number(n=510)	Percentage (%)
1. What is detergent?		
Chemical	199	39.02
Powder	56	10.98
Agent to clean clothes	245	48.04
Other	10	1.96
2. Why to use detergent?		
To remove dirt	245	48.04
To remove smell	26	5.1
For easiness of cleaning	230	45.1
Other	9	1.76
3. Cost of detergent?		
Cheap	46	9.02
Affordable	408	80.0
Expensive	56	10.98
4. How do you select detergent?		
Cheap	46	9.02
Expensive	9	1.76
By brand name	97	19.02
By previous satisfaction	311	60.98
Looking at good packaging	9	1.76
By others' recommendation	9	1.76
Quality	9	1.76
On market availability	9	1.76
As shopkeeper recommended	11	2.16
5. What kind of detergent are you using?		
Powder	446	87.45
Liquid	54	10.59
Other	10	1.96
6. What makes you unsatisfied not to use some particular brand next time?		
Quality	383	75.1
Price	92	18.04

Other	35	6.86
7. What is your comment to make good detergent that can satisfy customers?		
Good quality with reasonable price	485	95.1
Good quality and expensive	9	1.76
Other	16	3.14
8. Which brand do you use?		
Patanjali	36	7.06
Ghadi	82	16.08
Wheel	182	35.69
Other	210	41.17
9. Which country product is good?		
Nepal	191	37.45
India	246	48.23
Other foreign brand	56	10.98
Not sure	10	3.34
10. Do you wear gloves while using detergent?		
Yes	45	8.82
No	465	91.18
11. Do you know that the detergent can harm your skin?		
Yes	255	50.0
No	82	16.08
Not sure	173	33.92
12. Do you have any allergy or dryness on using detergent?		
No	454	89.02
Dryness	51	10.0
Redness/Allergy	5	0.98
13. Do you have washing machine?		
Yes	117	22.94
No	393	77.06
14. How long do you soak clothes in detergent?		
5 to 10 min	100	19.61
10 to 20 min	137	26.86
20 to 60 min	164	32.16
No waiting, Direct wash	109	21.37
15. Where you throw wastewater after washing?		
Normally with other water	410	80.4
Separately	100	19.6
16. Do you know the detergent wastewater can contaminate the environment?		
Yes	346	67.84
No	36	7.06
Not sure	128	25.1
17. What do your family members comment on using detergent?		
Don't use more it's expensive	91	17.84
Use more to wash properly	146	28.63
Close after using	128	25.1
Don't contaminate with water	73	14.31
Other	72	14.12
18. Do you use soap along with detergent for proper cleaning of clothes?		
Yes always	191	37.45
No	128	25.1
Sometime I use	191	37.4
19. Do you observe stability problems in detergent?		
Dry easily	55	10.78
Easily wets by moisture	328	64.31
Color change	82	16.08
Other	45	8.83

20. Do you like colorful detergent?		
Yes	146	28.63
No	364	71.37
21. Do you suffer with color transfer from detergent to clothes?		
Yes	219	42.94
No	291	57.06
22. Do you think new company need to manufacture good detergent?		
Yes	393	77.06
No	36	7.06
Not sure	81	15.88
23. Have you used herbal detergent?		
Yes	191	37.45
No	319	62.55
24. Have you used laundry detergent for other purposes?		
No, for washing cloth only	310	60.78
To wash dishes	100	19.61
To wash hand	28	5.49
To wash body	9	1.76
Other	63	12.36
25. Are you satisfied with the packaging?		
Yes	383	75.1
No	127	24.9
26. Who wash clothes in your family?		
Myself	355	69.61
My mother	100	19.61
My father	0	0.0
Other	55	10.78
27. Will you buy if you find another foreign brand detergent in Nepal?		
Yes of course	227	44.51
No, it may be very expensive	91	17.84
Not sure	218	37.65
28. Do you think the people dirtiness in our country is due to poverty, so can't buy enough detergent to wash clothes?		
Yes	296	58.04
No	194	38.04
Not sure	20	3.92

Use of washing machines can decrease the effect of detergent to skin. In developing countries the majority of people still do not have a washing machine and in this study 77.06% of the participants do not have one. Washing should be started after a certain time period of soaking the clothes [27] so the detergent can penetrate properly and clean the items effectively. However, 21.37% of participants start washing immediately after the addition of detergent, and only 32.16% soak their clothes for 20 to 60 minutes. After using detergent the waste water needs to be disposed properly but the majority of the participants throw the detergent waste water like normal sewage (80.4%) and only 19.6% throw it out separately. These kinds of practices lead to the contamination of the environment and water sources [12,28,29]. Regarding the harm caused by detergent to the environment, 67.84% are aware that the detergent can contaminate the

environment, 25.1% have no idea about it and 7.06% don't think that detergent can harm the environment. Therefore, continued education is needed to help people become more about detergent and its effects. The most observed stability problem in detergent is that it: absorbs moisture and gets wet easily (64.31%) followed by color change (16.08%) and dryness (10.78%). 42.94% observed the color transfer from detergent to clothes. This may be the reason that only 28.63% of the participants prefer colorful detergent. Along with washing clothes the laundry detergent can also be used for other purposes [1] and similar result observed in this study. (%). None of the participant's father washes their children clothes but mother do. This may be due to the male dominant society and still most of the household work and child caring are performed by women [30]. As poverty has direct relation to poor hygiene and sanitation [31]

which is expressed in this study that the majority of the participants realized that the dirtiness of country people is due to poverty (58.04%).

This study is based on an online survey, so the people who can use smart phones (or possess one) and have access to the Internet took part in this survey. A large group of people in Nepal are still unable to read and write thus, this research has limitations in representing those particular groups and the results may vary depending on the urban and remote area living people.

5. CONCLUSION

As detergent use is growing throughout the world, the concern about its proper use and waste management is important. In this study we identified the moderate level of the KAP of using detergent. We conclude that the awareness regarding safety concern and detergent-waste water management is needed. The further specific effects of detergents to different environmental factors are under study and will be reported in due courses.

DISCLAIMER

Authors have declared that no competing interests exist. The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

FUNDING

All authors contributed voluntarily to carry out the overall process and Hami Sakshyam Nari (HSN Nepal) helped in printing and provided space to prepare this manuscript.

CONSENT

As per international standard or university standard, Participants' written consent has been collected and preserved by the author(s).

ETHICS APPROVAL

It is not applicable.

ORCID ID

<http://orcid.org/0000-0002-0303-5677>

<http://orcid.org/0000-0003-4745-2293>

ACKNOWLEDGMENTS

We heartily acknowledge Hami Sakshyam Nari (HSN Nepal) for providing necessary things to perform this research and to all of the participants who took part in this survey.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Bajpai D. Laundry detergents: An overview. *Journal of oleo science*. 2007;56(7):327-40.
2. Linke D. Detergents: An overview. *Methods in enzymology*. 463: Elsevier. 2009;603-17.
3. Wagg RE. Detergents in the factory. *Nature*. 1956;177(4502):249.
4. Mousavi SA, Khodadoost F. Effects of detergents on natural ecosystems and wastewater treatment processes: A review. *Environmental Science and Pollution Research*. 2019;1-10.
5. Southgate BA. Synthetic Detergents and the Treatment of Water and Sewage. *Nature*. 1956;178(4525):118-9.
6. Sharman SH. Extensive biodegradation of synthetic detergents. *Nature*. 1964; 201(4920):704-5.
7. Eliminating detergent foam. *Nature*. 1964; 203(4945):587-8.
8. Handler B. Brazil and biodegradable detergents. *Nature*. 1975;258(5530):8.
9. Committee on the effects of synthetic detergents. *Nature*. 1953;171(4360):912.
10. A NK. Wetting and detergent action. *Nature*. 1937;139(3514):423-4.
11. Available:<https://aocs.onlinelibrary.wiley.com/journal/15589293>
12. Richards A. Effects of detergent use on water quality in Kathmandu, Nepal: Massachusetts Institute of Technology; 2003.
13. Joshi DR, Adhikari N. An overview on common organic solvents and their toxicity. *Journal of Pharmaceutical Research International*. 2019:1-18.
14. Joshi DR, Adhikari N. Benefit of cow urine, milk, ghee, curd and dung versus cow

- meat. Acta Scientific Pharmaceutical Sciences. 2019;3(8):169-75.
15. Adhikari N, Joshi DR. Cow urine: The total research on cow urine from the very beginning to till date.
 16. Joshi DR, Adhikari N. Salts in organic synthesis: An overview and their diversified use. Asian Journal of Applied Chemistry Research. 2019:1-11.
 17. Joshi DR, Adhikari N. Green chemistry: Beginning, recent progress, and future challenges; 2019.
 18. Eysenbach G. Improving the quality of Web surveys: the Checklist for Reporting Results of Internet E-Surveys (CHERRIES). Journal of Medical Internet Research. 2004; 6(3):e34.
 19. Available:<http://www.grandviewresearch.com/industry-analysis/laundry-detergent-market>
 20. Available:<https://sciencing.com/environmental-impacts-of-detergent-5135590.html>
 21. Milwidsky B, Gabriel D. Detergent analysis: A handbook for cost-effective quality control. John Wiley & Sons, INC, 605 THIRD AVE, NEW YORK, NY 10158, USA; 1982.
 22. Ferri A, Osset M, Abeliotis K, Amberg C, Candan C, Owens J, et al. Laundry performance: Effect of detergent and additives on consumer satisfaction. Tenside Surfactants Detergents. 2016; 53(4):375-86.
 23. Samantaray A. A study on customer satisfaction: With special reference to detergent powder; 2015.
 24. Available:<https://www.alliedmarketresearch.com/press-release/liquid-detergent-market.html>
 25. Tiedemann D, Clausen ML, John SM, Angelova-Fischer I, Kezic S, Agner T. Effect of glove occlusion on the skin barrier. Contact dermatitis. 2016;74(1):2-10.
 26. Kiriya T, Sugiura H, Uehara M. Residual washing detergent in cotton clothes: a factor of winter deterioration of dry skin in atopic dermatitis. The Journal of dermatology. 2003;30(10):708-12.
 27. Landeck L, Baden LA, John SM. Detergents. Kanerva's occupational dermatology. 2020;1131-43.
 28. Pattusamy V, Nandini N. Detergent and sewage phosphates entering into lake ecosystem and its impact on aquatic environment. International Journal of Advanced Research. 2013;1(3).
 29. Ivon E, Etangetuk N, Ubi G, Anyanwu C, Nkang A, Ekanem A. Assessment of histopathological damages in African catfish (*Clarias gariepinus*) as Influenced by Nittol Detergent Aquatic Pollution in Nigeria. Annual Research & Review in Biology. 2020;1-11.
 30. Eek F, Axmon A. Gender inequality at home is associated with poorer health for women. Scandinavian journal of public health. 2015;43(2):176-82.
 31. Garriga RG, Foguet AP. Unravelling the linkages between water, sanitation, hygiene and rural poverty: The WASH poverty index. Water resources management. 2013;27(5):1501-15.

© 2020 Joshi et al.; This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

Peer-review history:

The peer review history for this paper can be accessed here:
<http://www.sdiarticle4.com/review-history/62694>