



# Impact of Disinfectant and Sanitizer on Human and Environment during COVID-19 Pandemic

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**Abstract:** *In context of pandemic COVID-19, all communities of world are under strong psychologically pressure of outbreak corona virus and its impact on human life. Due to its severity and deleterious effects, controlling and transmission of COVID-19 virus among society is at highest priority all over the world. According to WHO (World Health Organization) to avoid the infection of COVID-19 virus and combat directly with virus use the sanitizer or disinfected on daily basis as preventive strategies against COVID-19 virus. In present attempt, we have highlighted the detrimental effects of disinfectant or sanitizer on human and environment. Information on use of disinfectant and sanitizer to prevent the spreading of virus and its deleterious effects was collected from 10 families by web based (Google form) survey through different questionnaires. Gathered information reveals, that families are continuously applying disinfectant or sanitizer on body surface to inactive or destroy the effects of microorganism. As sanitizer and disinfectant is complex mixture of various concentrations of chemical agents and such chemicals may have adverse impact on human health, environment, water ecosystem and aquatic life as well. Collected information concluded that, about 90% families agreed that sanitizer and other disinfectant have adverse impact on human health, 80% families granted that sanitizer produce adverse effect on water ecosystem and 70% families said that sanitizer and other disinfectant have detrimental impact on environment and aquatic life. Finally, we recommended that, to reduce the side effect of disinfectant and sanitizer, we have to use the safe concentration, eco-friendly and herbal based sanitizer and disinfectant in present pandemic scenario.*

**Keywords:** Disinfectant, Sanitizer, Adverse impacts, Pandemic COVID-19, etc.

## I. INTRODUCTION

In context of pandemic COVID-19, all communities of world are under strong psychologically pressure of outbreak corona virus and its impact on human life. The sectors like educational institutes, industries, tourist, social events, mass gathering etc. are banned. In such circumstances, the World Health Organization (WHO, 2020) has declared the COVID-19 is a pandemic disease on 11th March. Furthermore, the WHO has released a guide line to control spreading of COVID-19 virus from human-to-human transmission and among communities as a preventive measure. The WHO suggested protective measure as like,

1. Social distancing (Maintain at least 1 meter),
2. Avoid mass gathering,
3. Use mask to cover mouth and nose,
4. Stay home and self-isolate and
5. Wash your hands with alcohol-based sanitizer, disinfectant or soap regularly and thoroughly your hands.

All these preventive measures are needed to avoid the covid-19 virus infection and its severe respiratory disorder. In such circumstances, usage of sanitizer and disinfectants are widely applied all over the world to control the spreading and growth of corona virus.

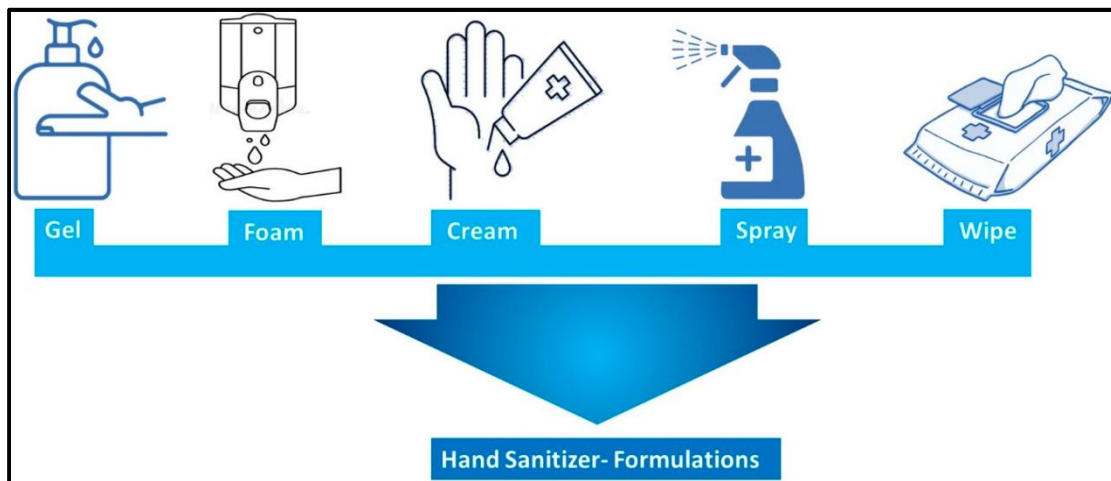
The hand sanitizer, soap, bleach and chlorinated solution and other disinfectant are mainly use to clean and remove the pathogenic agents like bacteria, viruses, fungi and other causative organisms. According to the World Health Organization (WHO, 2020) to control the microbial infection, we have to use alcohol-based hand sanitizer (ABHS)



(Sattar, 2004; Manocha et al., 2003). The sanitizers made by various chemical composition like alcohol, chlorine, iodine ammonium component, Peroxygens, phenols etc. (Jing et al., 2020).

At present, the significant global awareness and concern has been increased on the usage of sanitizer or disinfectant due to emergence of corona virus. Hence there was huge amount of hand sanitizer and disinfectants are used among society to throw away the microbial infection (<https://www.ecdc.europa.eu/en/>).

According to Jing et al., (2020) the hand sanitizers are of various types like anti-microbial soaps, water-based or alcohol-based sanitizers while mode of applying over hand also having various method such as rubbing, foaming, or wipes, gel, cream etc.



Source of image: Jing et al., (2020)

In addition, the government authority has setup the disinfectant tunnel at various places across the city to avoid the infection of Covid-19 virus and personal safe against virus. In tunnel spray, use large concentration of alcohol based solution along with disinfectant like chlorine, sodium hypochlorite, chlorine and bleaching agent (Hindustan times, Apr 21, 2020).

As recommended by WHO, use alcohol-based sanitizer for hand cleaning against contagious infection of COVID-19 virus before and after contact with patients and any suspicious devices or objects of contact with contaminated patients of COVID-19.

According to expert, there were some detrimental effects encounter due to usage of sanitizer or disinfectant like allergic reaction, skin irritation, crack or peel, and rashes etc. Such effect was reported when endlessly or impurity inherent sanitizer used (Larson et al., 2001; Boyce et al., 2000). In other hand, the spraying tunnels as the disinfectant chamber used sodium hypochlorite solution to disinfect the microbial infection. However, the sodium hypochlorite solution produces harmful effect on health such as irritation to eyes, skin and mouth. (<https://timesofindia.indiatimes.com/>)

In present attempt, we have collected the people responses on using of sanitizer and disinfectant against COVID-19 virus and its impact human and environment through online survey by different questionnaires.

## II. METHODOLOGY

In this study, the data on sanitizer, hand wash and other disinfectant in context of outbreak pandemic COVID-19 virus was collected randomly from 10 different families of Kolhapur, Maharashtra. Information was collected through online questionnaires regarding using of different types of sanitizers, disinfectant, soap and hand wash for preventing the infection of pandemic corona virus. In questionnaires, 13 different questions were asked regarding sanitizer and its impact. Questionnaires are as follows.

1. Are you using Sanitizer or Disinfectant?
2. Are you using Soap?
3. Are you routinely using Soap and Sanitizer?
4. Type or company of Sanitizer or Disinfectant?

5. Alcohol based or Non- Alcohol Based sanitizer or Disinfectant?
6. % Of Alcohol in Sanitizer?
7. What type of hand hygiene?
8. Did Sanitizer or disinfectant is effective to prevent Corona Virus infection?
9. Do you need a formal training for alcohol-based hand wash method?
10. Did Sanitizer effect on Human health?
11. Did Sanitizer effect on Environment?
12. Did Sanitizer effect on Water ecosystem?
13. Did Sanitizer effect on Aquatic life?

All questionnaires were prepared in Google form and Google link has been sent to 10 families of my residential area (Kolhapur) and information was collected.

Similarly, in case of spraying tunnels of sanitizer, we have used questionnaires as below to collect data from families.

1. Is tunnel sprayer being essential for disinfection of microbial activity?
2. Do you have any negative impact on your health after using tunnel sprayer?
3. If yes, following which kind of impact you experienced?
4. Is tunnel sprayer sanitizer produced negative impact on environment?
5. Is tunnel sprayer sanitizer produced negative impact on water bodies?
6. Is tunnel sprayer sanitizer produced negative impact on flora and fauna of water bodies?

### **III. RESULT AND DISCUSSION**

In the present study, analysis is purely based on data collected through web based from the families and their perception on sanitizer and disinfectant used on large scale in corona pandemic. The information was gathered on various sanitizers and other disinfectants used by 10 families to control the transmission of corona virus. (Table 01). Similarly, the data on sanitizing spraying tunnels also collected from same families.

According to information collected on hand sanitizer and disinfectant through questionnaires, out of 10 families, 9 families were used different brands of sanitizer for hand wash while one family was used Dettol hand wash for avoiding the infection of coronavirus. In addition, 5 families along with sanitizer they used soap for hand wash whereas five families only applying sanitizer for hand wash. (Figure 01 and 02). All 10 families were routinely used hand sanitizer and soap for hand cleaning as and when required. (Figure 03).

For regulating or preventing the spreading of pandemic outbreak corona virus there are different brands or company introduces the sanitizer and disinfectant against the corona virus. There are well known 38 categories or brand of hand sanitizer available in market. These hand sanitizers are of two types as Alcohol based sanitizer and non-alcohol-based sanitizer. (<https://www.allure.com/gallery/best-hand-sanitizer>).

Out of 10 families, 9 families (90%) were used alcohol-based hand sanitizer of 8 different brands like Lifebuoy, Raw sugar, Jonson and Jonson, Dermagaurd, Instaid's Blue, Himalaya, Patanjali and Dettol. Whereas, one family was used regular hand wash i.e., of Santoor brand. (Figure 04 and 05). In alcohol-based sanitizer, maximum 3 (30%) families were used above 90% of alcohol-based sanitizer, 2 (20%) families were used each above 60%, 70% and 80% alcohol-based sanitizer. However, one family was used non-alcohol based routine hand wash of Santoor. (Figure 06).

In hand cleaning method, 60% of families applying hand washing technique while 40% families were used hand rubbing technique for hand wash with sanitizer or disinfectant. (Figure 07). About application of sanitizer or disinfectant, the 60% families were agreed that the sanitizer help in preventing the contagious spread of corona virus from human to human. About 30% of families were not sure that sanitizer has positive impact on controlling the corona virus while 10 % family was don't know either sanitizer help in preventing the spreading of corona virus. (Figure 08). Regarding proper training of hand wash, half of families were said that there was no need of any formal training or awareness for alcohol-based hand wash, while 30% families were saying that we need formal training on hand wash and 20% families are not sure about need of training particularly for alcohol-based sanitizer. (Figure 09).

The hand sanitizer or disinfectant is used to controlling the COVID-19 virus. The sanitizer and disinfectant are complex mixture of various concentration of chemical like, alcohol, chlorine, ammonium and other additives. These all chemical



or synthetic content of sanitizer may have adverse impact on human health, environment, water ecosystem and aquatic life as well (Jing et al., 2020). According to collected data, about maximum 90% families were agreed that sanitizer and other disinfectant have adverse impact on human health, 80% families also said that sanitizer produce adverse effect on water ecosystem and 70% families granted that sanitizer and other disinfectant have detrimental impact on environment and aquatic life. (Figure 10).

To cope up with COVID-19, the disinfecting tunnels, or chambers, have been used on large scale at metro level. Some places like shopping mall, market, bus station, railway station, and airport, where people gather on huge number. Hence, at such regions the disinfecting tunnels or sanitizer spray was installed. But now days, these spraying tunnels or chambers are removed from main places, because the chemical contents which used in tunnel sprayers are causing physically and psychologically impact on human. The chemical content like sodium hypochlorite, chlorine, bleaching solution agent are principle used in tunnel sprayers. This chemical directly or indirectly produced adverse impact on human health. The Health Ministry of India recently said the tunnel sanitizer sprayer is not safe as human view point. (<https://economictimes.indiatimes.com/> and <https://www.deccanchronicle.com/>).

In our Kolhapur, there were three spraying tunnels were installed one at Shahupuri Police station, second at Central Bus Stand and third at Railway Station. (<https://timesofindia.indiatimes.com/>). But presently spraying tunnels are not active and it removed due to its adverse effect on human health. According to experts and evidence reported that the chemical used in tunnel sprays are enter in eyes, mouth, nose or spread all over body. Due these chemicals, the skin or body irritation, skin rashes, itching in eyes, difficulty in breathing such cases are reported. According to World Health Organization (WHO) using Sodium Hypochlorite chemical in tunnel spray is harmful to people. (<https://www.deccanchronicle.com/>). According information collected among families, about 80% families are agreed that the sanitizer spraying tunnels are required to control microbial activity or disinfection while 20% families were not agreed. (Figure 11).

In spite of regulating the microbial infection by spraying tunnels but according to people (100%), the tunnels are responsible for produce negative impact on human health and other illness. (Figure 12). Among families, the negative impact of spraying tunnels such as irritation in eyes and skin or body were maximally noted, followed difficulty in breathing than rashes or inflammation on skin were reported. While in small case paining and restless like effect also noticed among families. (Figure 13). As per as concern at environment view point, 60% families agreed and 30% families are strongly agreed that chemicals of spraying tunnel were produced negative impact on environment while only 10% families says that spraying tunnels does not have negative impact on environment. (Figure 14). In case of impact on water bodies, 60% families are strongly agreed and 30% families only agreed that chemicals of spraying tunnel were produced significant negative impact on water bodies. Whereas, only single family was don't know about its effect on water bodies. (Figure 15). Similarly, 50% strongly and 30% only agreed that chemicals of spraying tunnel show adverse effect on aquatic flora and fauna. However, one family was disagreed and one doesn't know about its effect on aquatic flora and fauna. (Figure 16).

In present scenario, usage of water for domestic and hospital purpose has been substantially increased for maintaining the hygiene like washing and cleaning amenities. These leads in to regular discharge of effluent or contaminated water of domestic use and biomedical waste from hospital and are directly discharge into water bodies. Particularly, the sanitizer or disinfectant used during hand wash or in spraying tunnels is composite of several chemicals (Sodium hypochlorite, Citrobio Shield, Chlorine or bleach solution) for anti-microbial activities with some additives. (U.S. EPA, 1994; Brondeau et al., 2000). Such chemical is heavily loaded in water bodies and cause the adverse impact on water ecosystem.

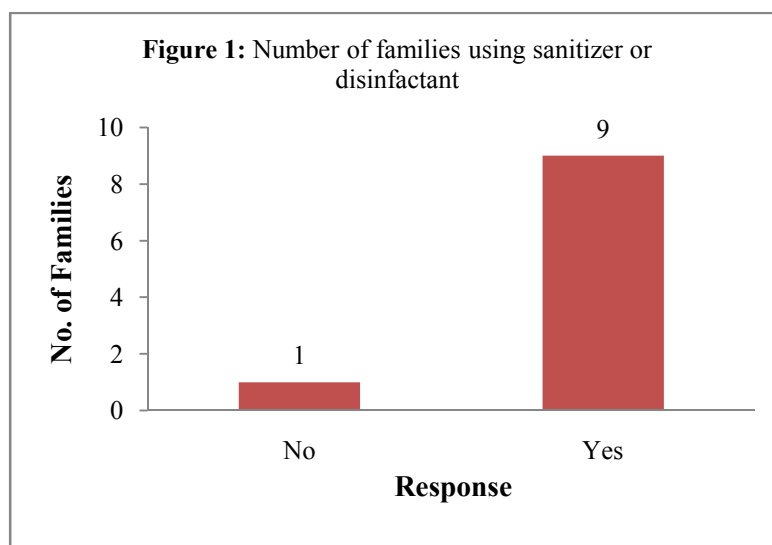
According to Wang et al., (2007) the chlorine residual effluent was produced adverse impact on pond ecosystem. Some literature reported that, the Sodium hypochlorite (NaOCl) used as anti-microbial disinfecting in hospital and it discharges into water bodies through waste water and may have deleterious effect on aquatic organism and water quality (Emmanuel et al., 2004). In earlier study observed that, discharge of Sodium hypochlorite (NaOCl) from domestic and biomedical waste in water ecosystem, the water parameters like TSS, COD, TOC and Chlorine concentration has been significantly increased in water bodies and reduces the quality of water bodies. (EPA, 1989 and Metcalf and Eddy, 1991).

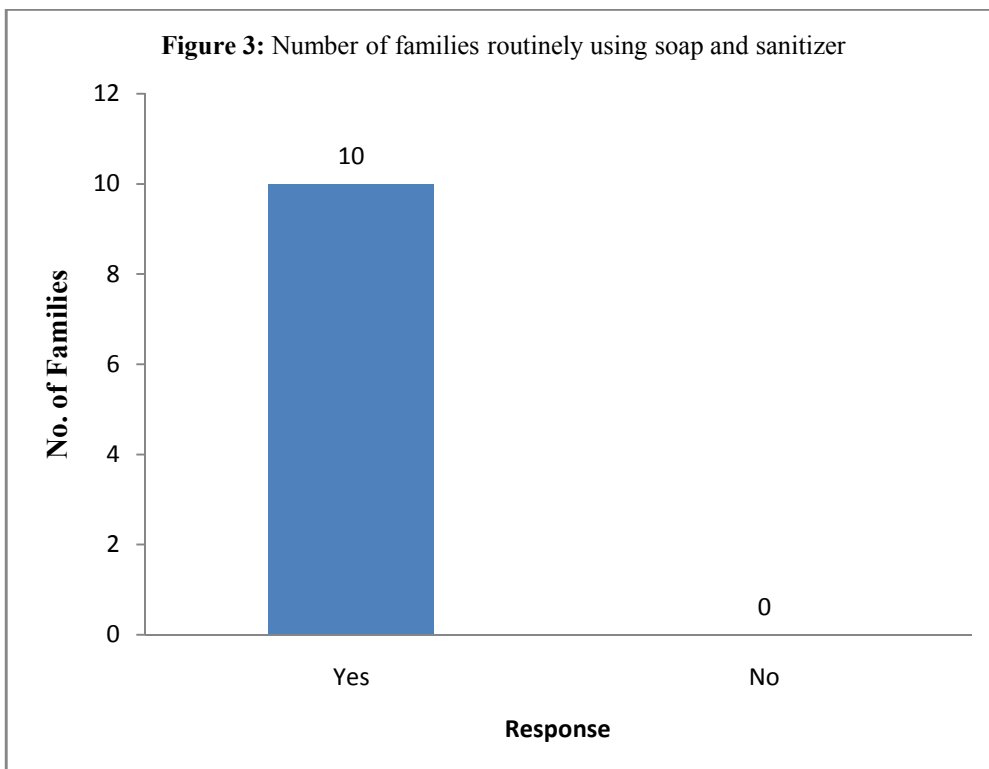
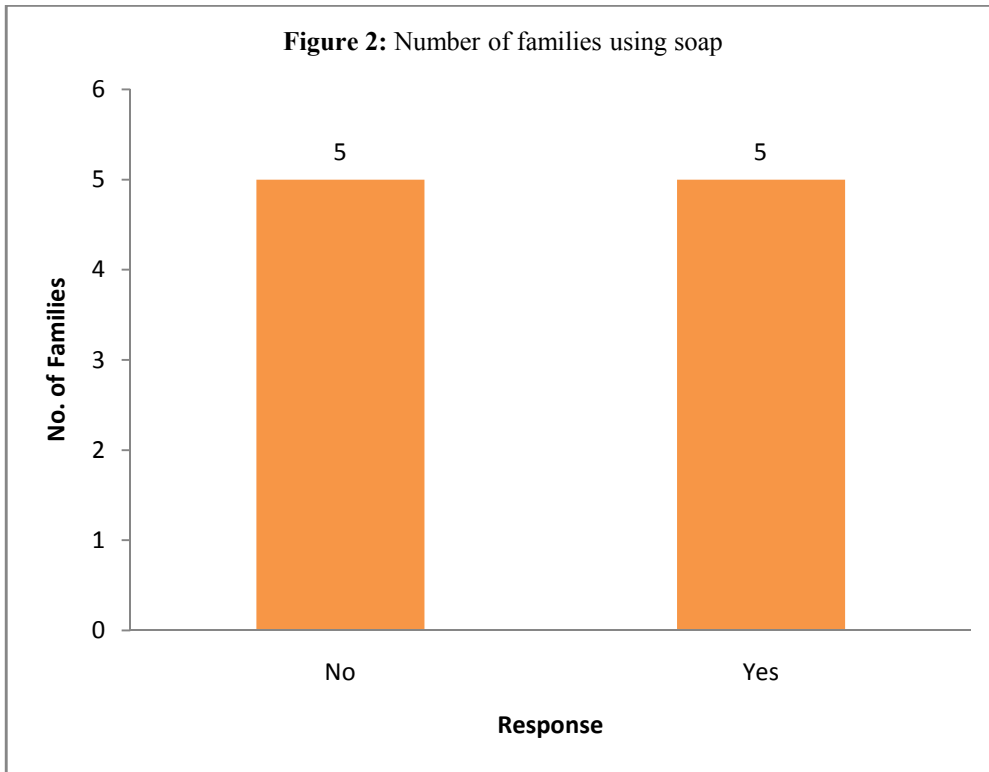


**Table 1:**Family wise data collected on use of sanitizer on corona virus through questionnaires

| Questionnaires  | Family1       | Family2       | Family 3      | Family 4      | Family 5      | Family 6          | Family 7      | Family 8          | Family 9      | Family10      |
|---|---------------|---------------|---------------|---------------|---------------|-------------------|---------------|-------------------|---------------|---------------|
| Are you using Sanitizer or Disinfectant                                       | No            | Yes           | Yes           | Yes           | Yes           | Yes               | Yes           | Yes               | Yes           | Yes           |
| Are you using Soap  | Yes           | No            | Yes           | Yes           | No            | No                | Yes           | No                | No            | Yes           |
| Routinely used Soap and Sanitizer   | Yes           | Yes           | Yes           | Yes           | Yes           | Yes               | Yes           | Yes               | Yes           | Yes           |
| Type or company of Sanitizer or Disinfectant                                  | Dettol        | Patanjali     | Himalaya      | Himalaya      | Instaids-Blue | Santoor hand wash | Dermogard     | Jonson and Janson | Raw sugar     | Lifebuoy      |
| Alcohol based or Non-Alcohol Based sanitizer or Disinfectant                  | Alcohol based | Alcohol based | Alcohol based | Alcohol based | Alcohol based | Non-Alcohol based | Alcohol based | Alcohol based     | Alcohol based | Alcohol based |
| % of Alcohol in Sanitizer   | 69.40%        | 99%           | 70%           | 70%           | 80%           | Nil               | 80%           | 91%               | 62%           | 95%           |
| What type of hand hygiene?  | Washing       | Washing       | Rubbing       | Washing       | Rubbing       | Washing           | Rubbing       | Washing           | Rubbing       | Washing       |
| Did Sanitizer or disinfectant is effective to prevent Corona Virus infection? | Yes           | May be or not | Yes           | May be or not | Yes           | Don't no          | Yes           | May be or not     | yes           | yes           |
| Do you need a formal training for alcohol-based hand wash method?             | May be or not | Not necessary | Not necessary | Yes necessary | Not necessary | Not necessary     | Not necessary | May be or not     | Yes necessary | Yes necessary |
| Did Sanitizer effect on Human health?   | No            | Yes           | Yes           | Yes           | Yes           | Yes               | Yes           | Yes               | Yes           | Yes           |
| Did Sanitizer effect on Environment?  | No            | Yes           | Yes           | Yes           | Yes           | No                | Yes           | No                | Yes           | Yes           |
| Did Sanitizer effect on Water ecosystem?                                      | Yes           | Yes           | Yes           | Yes           | Yes           | No                | Yes           | No                | No            | Yes           |
| Did Sanitizer effect on Aquatic life?   | No            | Yes           | Yes           | Yes           | Yes           | No                | Yes           | No                | Yes           | Yes           |

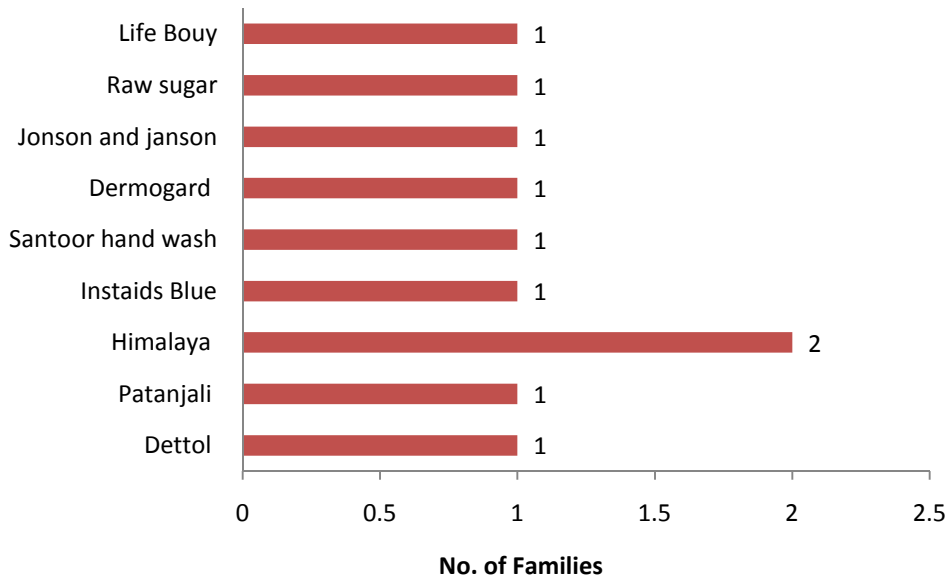
**Figures of family response on hand sanitizer, disinfectant and spraying tunnel**



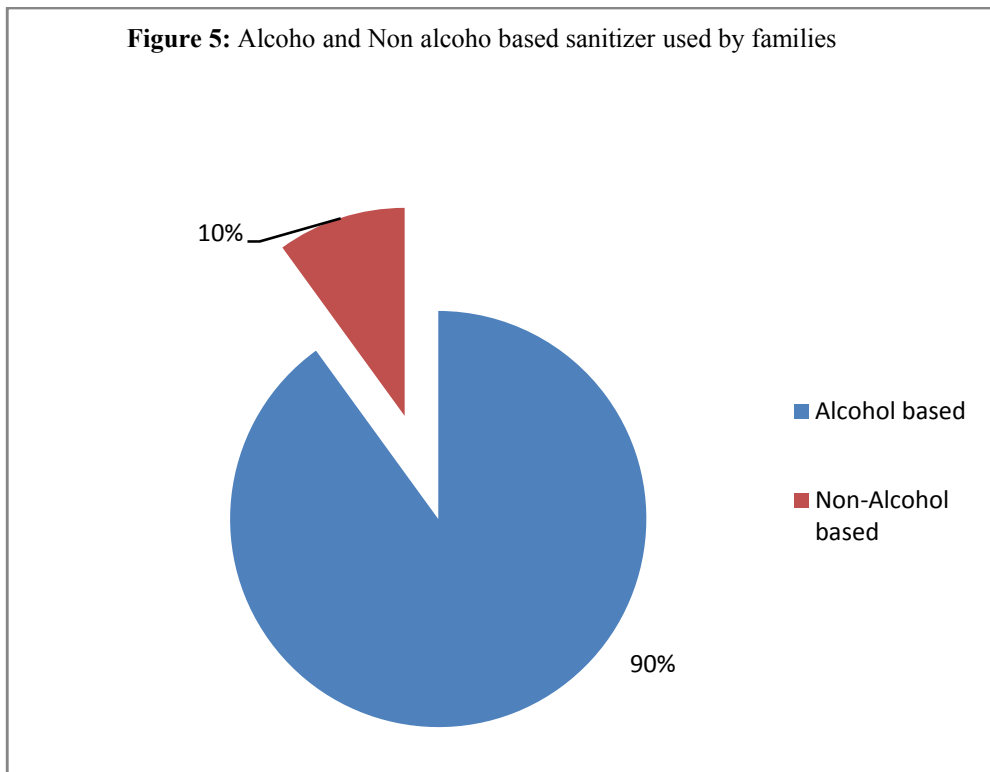




**Figure 4:** Different type of brand of sanitizer used by families

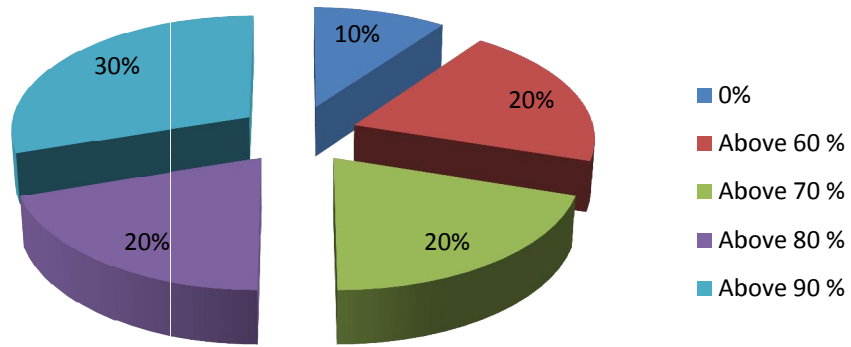


**Figure 5:** Alcoho and Non alcoho based sanitizer used by families

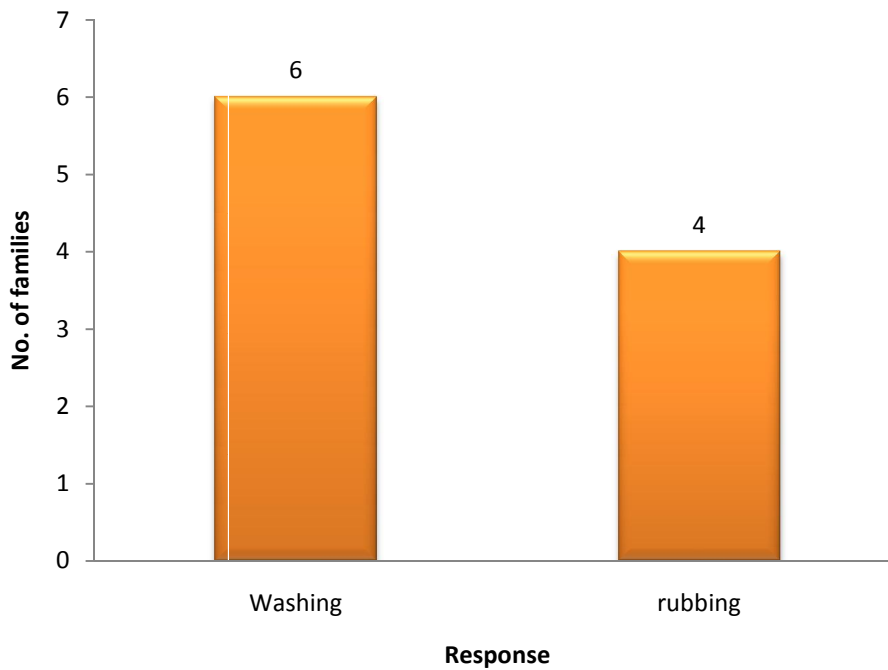




**Figure 6:** Percentage of alcohol in sanitizer used by families



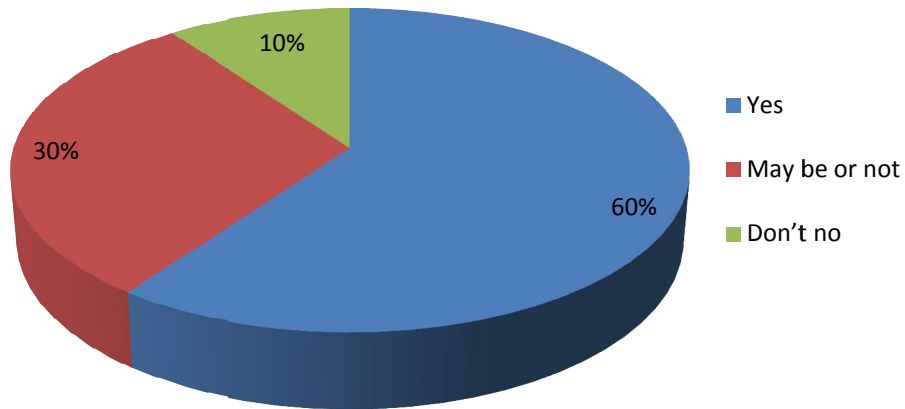
**Figure 7:** Method of hand hygiene



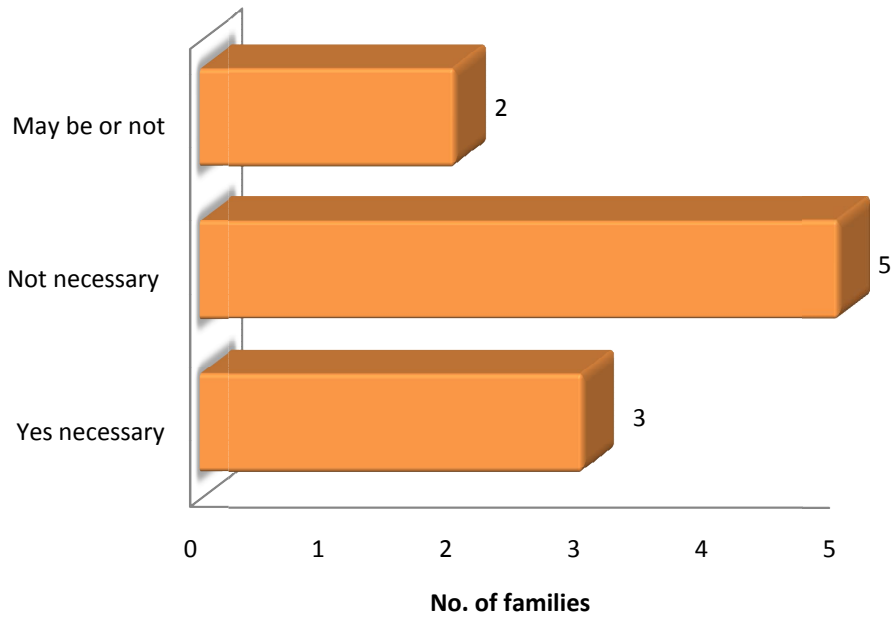


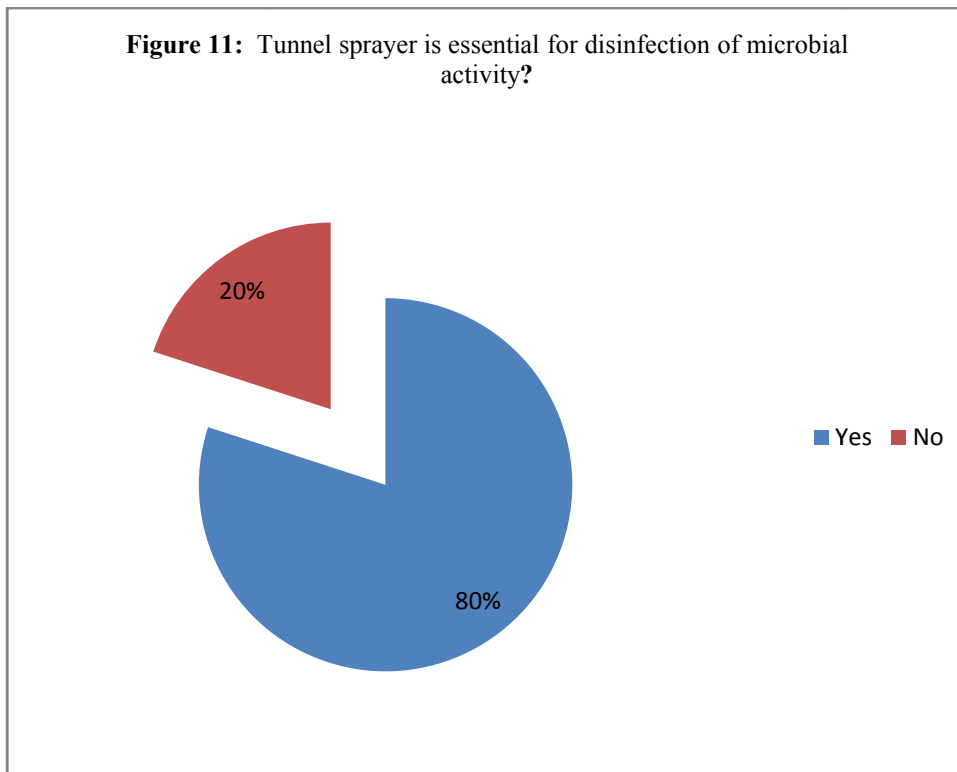
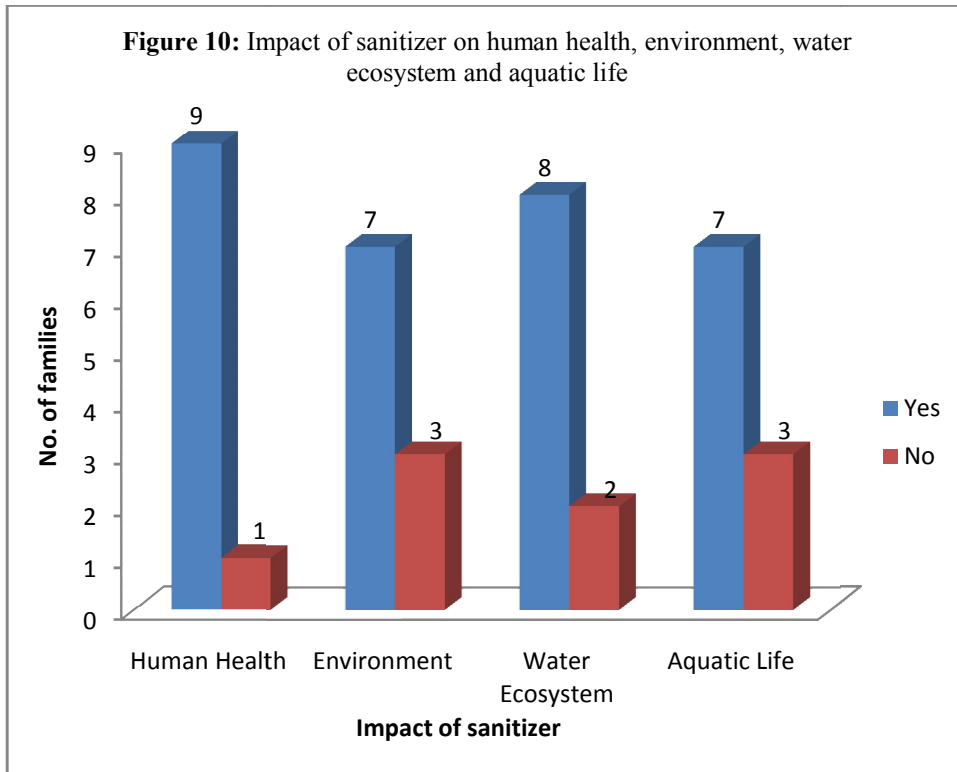


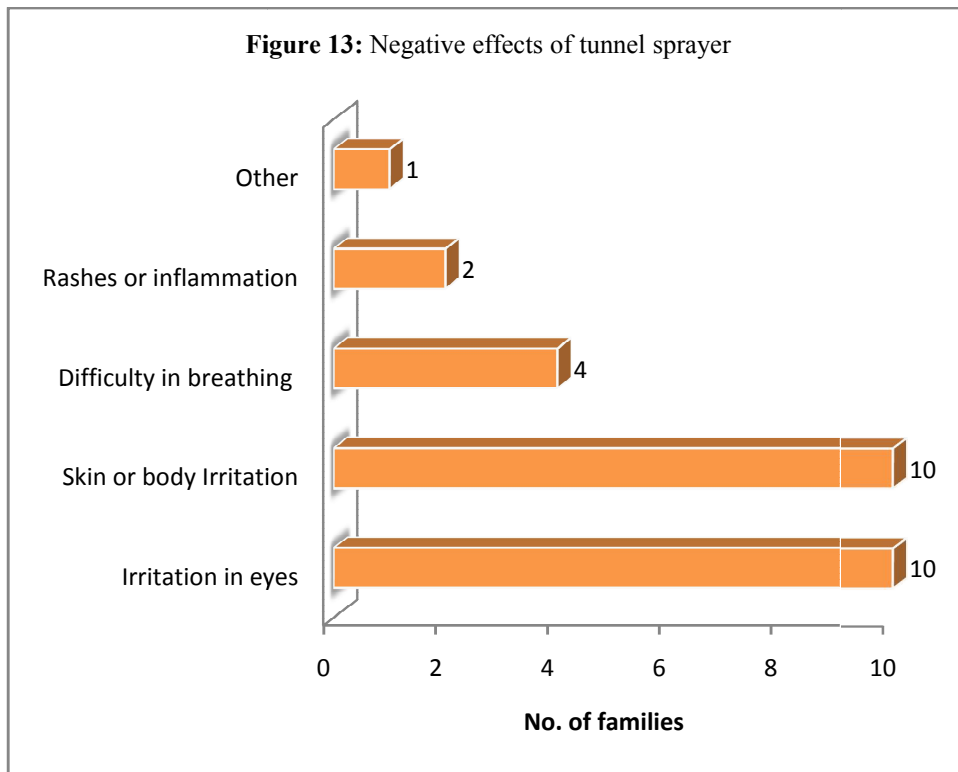
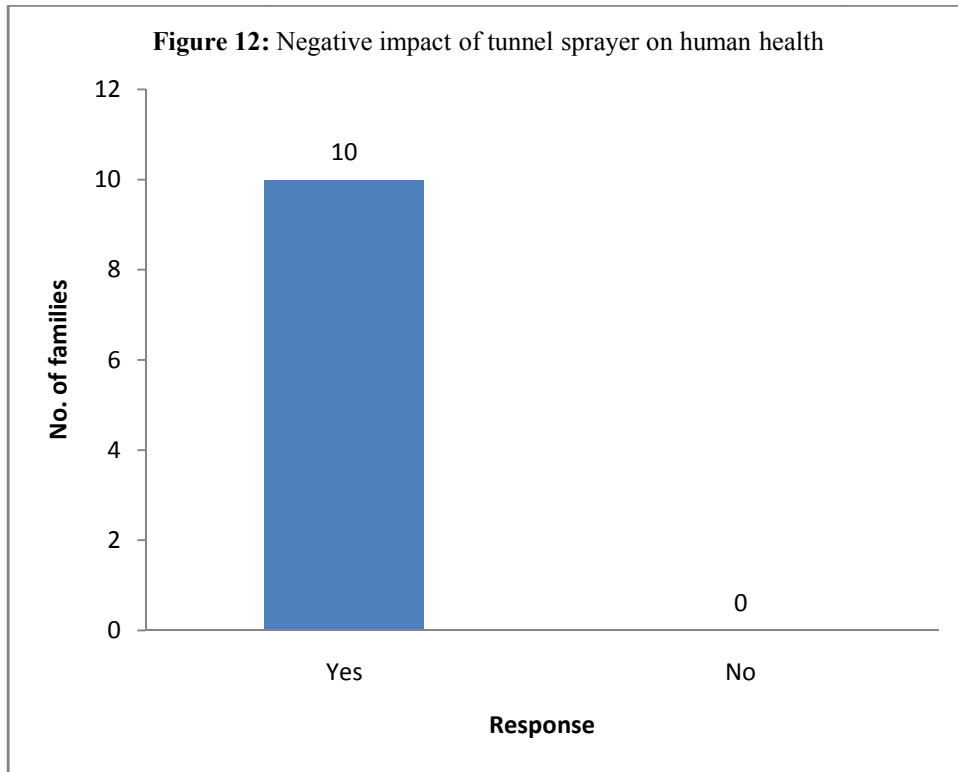
**Figure 8:** Impact of sanitizer on corona virus ?



**Figure 9:** Formal training on alcohol based sanitizer use is needed or not ?

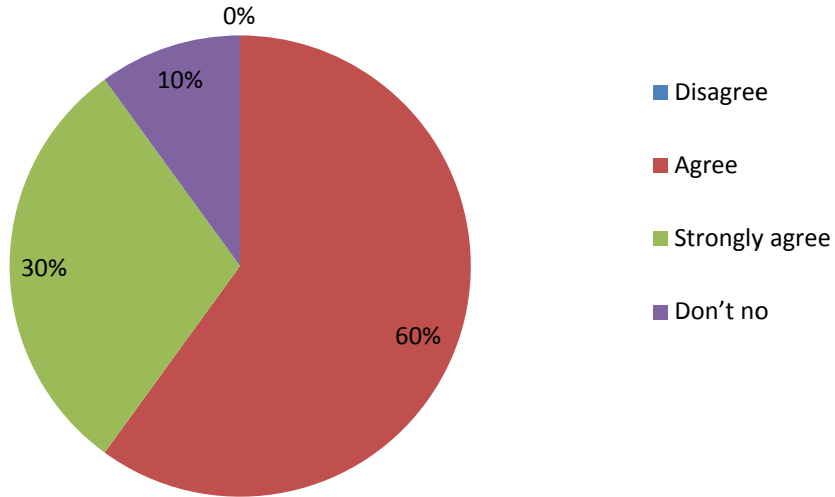




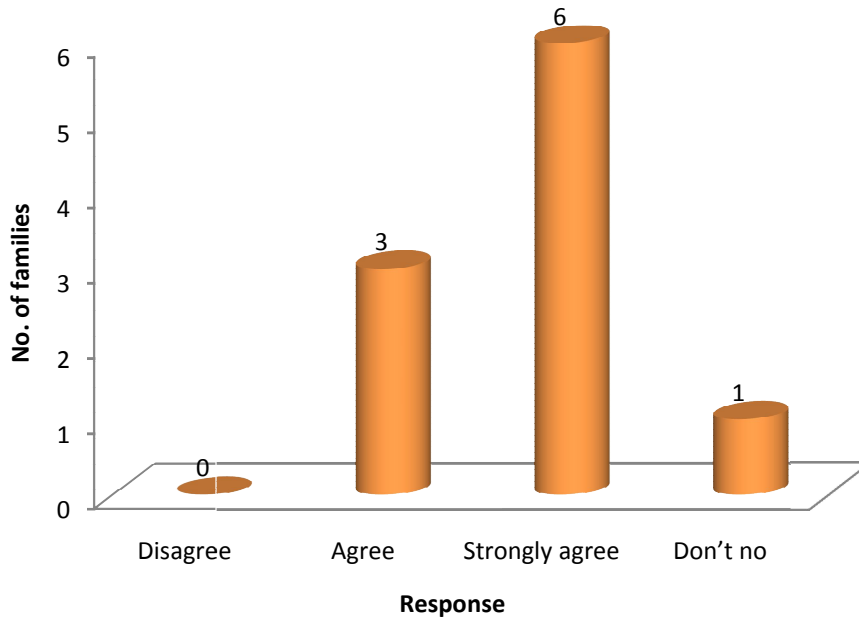


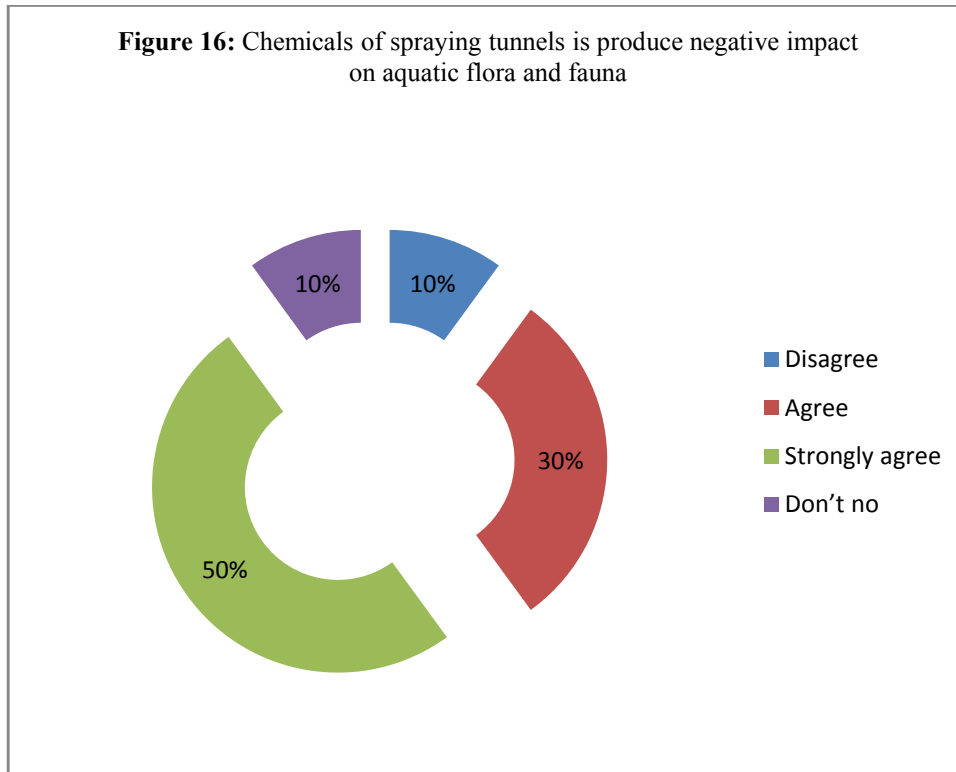


**Figure 14:** Chemicals of spraying tunnels is produce negative impact on environment.



**Figure 15:** Chemicals of spraying tunnels is produce negative impact on water bodies





**IV. CONCLUSION**

In context of pandemic corona virus, The WHO, State and Indian Health Ministry and strongly recommended that use sanitizer or disinfectant to avoid contagious transmission of corona virus from human to human. Henceforth, sudden usage of sanitizer and other anti-microbial disinfectant are among communities are substantially increased and various type of hand sanitizers entered in market (alcoholic or water based) for hand hygiene. The certain chemical like Sodium hypochlorite, Chlorine and other additive chemicals are present in hand sanitizer, ant-microbial soap which help in controlling the microbial activity moreover, the excess use of such chemicals may cause harmful effect on human health and as well on environment. Due to these chemicals, issues like allergy, skin irritation, eyes are more common among society. Chemicals also contaminated the water bodies and decline the water quality by increased value of chlorine and other toxic chemicals in water bodies. As environment view point, increased value of toxic content in water bodies also produce harmful effect on aquatic organism, declining drinking status and unsafe for agriculture practices and also not secure for other domestic purpose.

**V. RECOMMENDATION**

We personally, suggest that, instead of chemical hand sanitizer, we should use natural homemade extract of anti-microbial compound like Turmeric, Aloe Vera, Peppermint, Neem, and Clove for controlling the microbial infection. These attract mixed with natural oils, which also having anti-bacterial activity like Eucalyptus oil, Cinnamon oil, menthol oil and lavender oil etc are used to prevent the bacterial activity. Prepared own home-made herbal hand sanitizer for anti-microbial infection by mixture of two herbal compounds i.e., extract of natural compound and natural oil. This herbal sanitizer is safe for our soft hand or body and also favorable for environment view point. In addition, the waste water from domestic and hospital sector are not directly discharge in water bodies, it should treat and removed all contaminated content of them and then discharge in water bodies.

**REFERENCES**

[1] Brondeau MT, Falcu M, Jargot S, Miraval S, Protois JC, Reynier M, et al. Eaux et extraits deJavel. Fichetoxicologique Nj 157 de l'INRS. Cah Notes Doc-Se'cur Hyg Trav 2000; 178:11 – 5



- [2] Evens Emmanuel, Ge' rard Keckc, Jean-Marie Blanchardb, Paul Vermandeb and Yves Perrodina: Toxicological effects of disinfections using sodium hypochlorite on aquatic organisms and its contribution to AOX formation in hospital wastewater, *Environment International* 30 (2004) 891–900.
- [3] Jane Lee Jia Jing, Thong Pei Yi 1, Rajendran J. C. B., Jason R. M., Nagendran T. and T.Madheswaran: Hand Sanitizers: A Review on Formulation Aspects, Adverse Effects, and Regulations, *Int. J. Environ. Res. Public Health* 2020, 17, 3326.
- [4] Manocha, S.; Walley, K.R.; Russell, J.A. Severe acute respiratory distress syndrome (SARS): A critical care perspective. *Crit. Care Med.* 2003, 31, 2684–2692.
- [5] Metcalf & Eddy. *Wastewater Engineering: Treatment, disposal, and reuse*. Revised by Tchobanoglous, G., Burton. 3rd ed. New York: F.L. Irwin/ McGraw-Hill; 1991.
- [6] Sattar, S.A. Microbicides and the environmental control of nosocomial viral infections. *J. Hosp. Infect.* 2004, 56, 64–69.
- [7] EPA, U.S. (United States Environmental Protection Agency). Reportable quantity document for chlorine, draft. Environmental criteria and assessment office. Cincinnati (OH): U.S. EPA; 1994b
- [8] World Health Organization and the United Nations Children's Fund (UNICEF), *Water, sanitation, hygiene, and waste management for the COVID-19 virus: interim guidance 2020*. Some rights reserved.
- [9] Ying Wang, Lin Wang, Yi Lu and Yazhou Wang: Effects of sodium hypochlorite on structure and function of pond microcosms, 2007; 36(2): 144-147.