

Investigating Handwashing Frequency in Canadians as a Result of the COVID-19 Pandemic

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Abstract

Background: The COVID-19 pandemic was an unprecedented event that has generated many changes in public behaviour. The purpose of this study was to examine if Canadians are increasing their handwashing compliance due to the pandemic as well as to assess if different demographic variables are associated with handwashing knowledge or behaviour.

Methods: An online survey was created using SurveyMonkey and distributed through Canadian subreddits. The survey included 12 questions regarding demographics, handwashing knowledge, and public opinion. Statistical analyses were conducted using the NCSS 2021.

Results: Based on data collected from 154 respondents, there was a 63% increase in handwashing frequency during the pandemic. Statistical analyses showed associations between handwashing frequency and higher education ($P = 0.02$) and handwashing frequency and greater exposure to health promotional efforts ($p = 0.01$). There were no statistically significant associations between handwashing frequency and gender ($p = 0.4966$), age group ($p = 0.1716$), nor between handwashing knowledge and handwashing frequency ($p = 0.8467$).

Conclusions: Health authorities and other government agencies should continue to educate and promote handwashing to the Canadian public, targeting specific higher risk groups such as those with less education, in order to reduce the transmission of COVID-19.

Keywords: Canada, Canadians, COVID-19, hand hygiene, handwashing, pandemic, SARS-CoV-2

Introduction

The current COVID-19 global pandemic has given researchers a reason to believe that the public has undergone some major behavioural changes (Knell et al., 2020). In Ontario, Canada where the 2003 SARS

epidemic occurred, some public health and healthcare professionals who had first-hand experience were able to apply their knowledge when managing the emergence of COVID-19 (Webster, 2020). The rest of the Canadian population, however, were underprepared

(Miller, 2020). As cases started to increase in March 2020, concerns of a decline in public handwashing compliance arose (Mussa, 2020). In response, government agencies and public health authorities worked together to educate and implement handwashing promotion programs throughout the country (WHO, 2020; BCCDC, n.d.; BCCDC, 2020; CDC, 2020a; CDC, 2020b; WorkSafeBC, 2020; HealthLink BC, 2020). By investigating if there is an increase in handwashing compliance, we can assess different factors that may influence handwashing behaviour.

Literature Review

The following review of literature will discuss the surface transmission of SARS-CoV-2, the importance and effectiveness of handwashing practices, the complications associated frequent handwashing, the statistics of public handwashing compliance prior to the pandemic, and lastly the current health promotion efforts that are in place.

How is COVID-19 transmitted through surface contact?

Before exploring the importance of handwashing, it is crucial to acknowledge how the virus is transmitted. According to the World Health Organization (2020), the SARS-CoV-2 virus can spread through droplet/aerosol transmission when in close contact with an infected person. Although, this virus can also spread by touching surfaces or objects that have been sneezed on, coughed on, or touched by an infected person (WHO, 2020). By implementing basic handwashing techniques, susceptible individuals can avoid getting infected through physical contact.

How does handwashing prevent COVID-19 transmission?

The emergence of SARS-CoV-2 inspired many studies to examine the nature of the virus

in order to find ways to prevent further spread. Hirose et al. (2020) conducted a microbiological study which observed the survivability of SARS-CoV-2 on human skin compared to the Influenza A virus (IAV). It was discovered that SARS-CoV-2 can survive significantly longer on skin surfaces than IAV (Hirose et al., 2020). Longer survivability indicates a higher possibility of infection when touching one's face with unclean hands.

In a news article produced by Stiepan (2020) from Mayo Clinic, vaccine researcher Dr. Gregory Poland explains how the chemical properties of soap can deactivate most viruses, including SARS-CoV-2. Amphiphilic surfactants that come from soap are able to embed themselves within the viral envelope by lowering the surface tension, which deactivates the virus (Stiepan, 2020). The remaining viral particles are then washed away with water and mechanical action (Stiepan, 2020).

With regards to hand hygiene, both handwashing with soap and water and the application of ABHRs (alcohol-based hand rubs) are considered acceptable methods of COVID-19 prevention. Mukherjee et al. (2020) conducted a study that evaluated the virucidal properties of several commercially available personal care products. A variety of Unilever soap bars, liquid cleansers and ABHRs were tested on SARS-COV-2 isolates (Mukherjee et al., 2020). The results showed a 3 to 4 log reduction using soap bars; a 3-log reduction using liquid cleansers; and a 4-log reduction using ABHRs (Mukherjee et al., 2020). Therefore, washing hands with soap and water can be just as effective as using ABHRs.

What are the complications associated with frequent handwashing?

Despite health care researchers confirming the efficacy of hand hygiene interventions, handwashing has its challenges as well. A research commentary by Gupta and Lipner (2020) observed how excessive

handwashing can increase the likelihood of acquiring irritant contact dermatitis (ICD). The chemical ingredient, sodium laureth sulfate (SLS), that is commonly present in hand soap, can induce skin dryness and increase the chances of ICD (Gupta & Lipner, 2020). Gupta and Lipner (2020) suggest that the use of moisturizers or sanitizers containing humectants may prevent ICD, especially for people who practice frequent handwashing.

What was the state of handwashing compliance before the COVID-19 pandemic?

Evaluating public handwashing compliance is notably a difficult task, therefore most Canadian studies only monitored these behaviours in healthcare workers.

From the Provincial Infection Control Network of BC (PICNet) (2020), which was made by BC's Provincial Health Services Authority (PHSA), a quarterly report showed hand cleaning compliance in various acute care (ACF) and long-term care (LTCF) facilities throughout the province from 2019 to 2020. According to the report, ACFs and LTCFs in the Interior Health, Vancouver Coastal Health, and Northern Health regions showed a steady increase in compliance over the course of one year; results from Fraser Health showed a decline in compliance; and lastly no changes were detected in the Island Health region (PICNet, 2020).

In Scotland, a survey study by Dickie et al. (2017) was conducted on university students to measure their handwashing compliance. A total of 255 students were assessed and females were detected to have washed their hands more often than males (Dickie et al., 2017).

What are the health promotion efforts that are currently in effect?

After the COVID-19 pandemic was announced, health organizations worldwide and all levels of government initiated several

health promotion programs. Information regarding handwashing importance; when and how often hands should be washed; and clear steps on how to wash them were made available online through various websites (e.g. WHO, British Columbia Centres for Disease Control (BCCDC), BC health authorities, HealthLink BC, Public Health Agency of Canada (PHAC)). All webpages showed the 5 handwashing steps: wet your hands, apply soap, scrub for 20 seconds, rinse, and dry. (BCCDC, n.d.; CDC, 2020a; CDC, 2020b; WorkSafeBC, 2020; HealthLink BC, 2020)

For those who do not have access or rarely access the internet, many health organizations made handwashing infographics. Infographics are capable of providing a quick summary of information along with images that are easily understood (WorkSafeBC, 2020). WorkSafeBC infographics were also distributed to many businesses while they were inspected by the public health authority.

In order to reach a younger audience, more time and effort was invested in social media websites like Twitter (BCCDC, 2020).

Methods and Materials

Materials

The materials that were used to conduct this survey study included: a secure laptop, SurveyMonkey online software (<http://www.surveymonkey.com>), Microsoft Office 365 Excel, and the 2021 NCSS Statistical Package. To gain more respondents and more statistical significance, those who participated in the study were invited to a prize draw at the end of the survey as an incentive. Participants provided their email addresses and were randomly selected to win a \$25 Amazon.ca eGift Card.

Methods

To gather public data regarding handwashing frequency in Canada as a result of

the COVID-19 pandemic, a 12-question online survey was created using the SurveyMonkey free online software (<http://www.surveymonkey.com>). Afterwards, the survey was distributed online through Reddit and was posted in a wide variety of Canadian subreddits. The survey was also forwarded to the contacts of the research supervisor for them to forward to their contacts.

The survey was comprised of questions that mainly focused on three different areas: demographics, knowledge testing, and public opinion. Data collection began on the 13th of January 2021 and ended on the 6th of February 2021.

Inclusion and Exclusion Criteria

Before participating in the study, respondents needed to provide consent and had to be a Canadian resident. Respondents who did not answer any questions or had not met the initial survey requirements were excluded from the data pool. Friends, family and classmates of the researcher were also excluded.

Ethical Considerations

To avoid confidentiality and anonymity issues, no personal information (e.g. emails) was collected and the data collected remained anonymous throughout the entire process. A consent form was provided at the start of the survey to fully disclose all participants regarding the type of data that would be collected and analyzed. Furthermore, participants had the option to leave the survey at any time and were never persuaded nor coerced to respond. This study also received approval from the BCIT Research Ethics Board (REB).

Results

Description of Data

The survey mainly collected multichotomous nominal and ordinal data. A

total of 155 responses were recorded from SurveyMonkey, of which 154 were usable for the analyses.

Descriptive Statistics

Out of a total of 154 respondents, 50 (32%) identified as males, 99 (64%) identified as females, 3 (2%) identified as other, and 2 (1%) preferred not to answer. When asked their age, 3 respondents (2%) were 0 to 15 years old, 65 (42%) were 16 to 30 years old, 55 (36%) were 31 to 45 years old, and 31 (20%) were 45 years old and above. Regarding their level of education, 8% of respondents had some high school or earlier grades, 23% had a high school diploma, 51% had a bachelor's degree, 14% had a master's degree, 3% had a PhD or above, and 1% preferred not to answer.

Afterwards, participants were given a 4-question handwashing knowledge quiz. The first question asked if it is recommended to wash your hands before and after food preparation. Out of a total of 154, 154 (100%) answered true, which was the correct answer. The second question asked if it is recommended to wash your hands immediately after coughing, sneezing, or blowing your nose. 147 (96%) answered true (correct answer), 6 (4%) answered false (incorrect answer). The third question asked participants to choose the correct sequence of handwashing steps that were recommended by the CDC (Centers for Disease Control and Prevention). Participants were given 4 choices, only 1 of which was the correct sequence. 151 (98%) chose the correct sequence, and 3 (2%) chose the incorrect sequence. The fourth and final knowledge question asked how long the recommended handwashing duration is. 2 (1%) answered 10 seconds, 114 (74%) answered 20 seconds, 18 (12%) answered 45 seconds, and 20 (13%) answered 1 minute. The correct answer was 20 seconds.

The last section of the survey asked questions to gather public opinion. Figure 1 shows that the majority of participants agreed that they are washing their hands more often due to the pandemic.

Figure 1: Handwashing frequency affected by the COVID-19 pandemic.

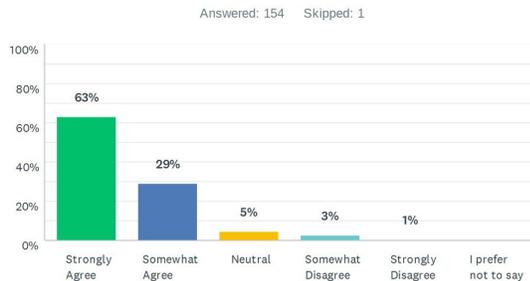
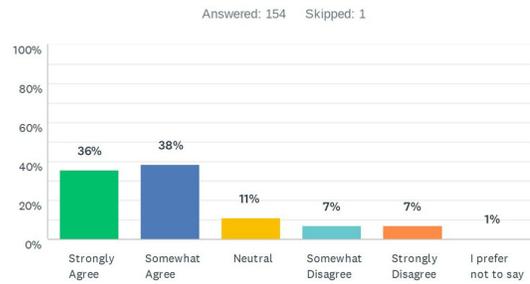


Figure 2 shows that the majority agrees that current health promotion efforts (handwashing signs, infographics, social media posts, etc.) have played a role in increasing how often they washed their hands.

Figure 2: Handwashing frequency affected by health promotion efforts.



Inferential Statistics

The table below (Table 1) shows the summary of all five inferential statistic tests that were conducted using NCSS 2021. To acquire more statistically significant results, some categories (age and education level) that had few responses were combined.

For the knowledge quiz section: 1 of 4 questions correct meant the respondents were “Not knowledgeable”; 2 out of 4 correct meant they were “Somewhat Knowledgeable”; 3 out of 4 correct meant they were “Fairly Knowledgeable”; and 4 out of 4 correct meant they were “Very Knowledgeable”.

Table 1: Null and alternate hypotheses

H ₀ and H _A	P-value	Conclusion
H ₀ : There is no association between gender and handwashing frequency due to the COVID-19 pandemic. H _A : There is an association between gender and handwashing frequency due to the COVID-19 pandemic.	0.4966	Cannot reject H ₀ and conclude that there is a no statistically significant association between gender and increase in handwashing frequency due to the COVID-19 pandemic.
H ₀ : There is no association between age and handwashing frequency due to the COVID-19 pandemic. H _A : There is an association between age and handwashing frequency due to the COVID-19 pandemic.	0.1716	Cannot reject H ₀ and conclude that there is a no statistically significant association between age and increase in handwashing frequency due to the COVID-19 pandemic.

<p>H0: There is no association between education level and handwashing frequency due to the COVID- 19 pandemic.</p> <p>HA: There is an association between education level and handwashing frequency due to the COVID- 19 pandemic.</p>	0.0233	<p>Reject H0 and conclude that there is a statistically significant association between education level and increase in handwashing frequency due to the COVID-19 pandemic. It appears that those with higher levels of education are more likely to wash their hands compared to those with lower levels of education.</p>
<p>H0: There is no association between exposure to handwashing promotion efforts and handwashing frequency due to the COVID-19 pandemic.</p> <p>HA: There is an association between exposure to handwashing promotion efforts and handwashing frequency due to the COVID-19 pandemic.</p>	0.0122	<p>Reject H0 and conclude that there is a statistically significant association between exposure to handwashing promotional materials and increases in handwashing frequency. Increased health promotion exposure appears to result in increased handwashing frequency.</p>
<p>H0: There is no association between handwashing knowledge and handwashing frequency due to the COVID-19 pandemic.</p> <p>HA: There is an association between handwashing knowledge and handwashing frequency due to the COVID-19 pandemic.</p>	0.8467	<p>Cannot reject H0 and conclude that there is a no statistically significant association between handwashing knowledge and increase in handwashing frequency due to the COVID-19 pandemic.</p>

Discussion

Based on the chi-square tests that were performed on NCSS 2021, it is evident that both education level and exposure to health promotion efforts led to an increase in handwashing frequency. Both chi-square tests resulted in a p-value of less than 0.05, which indicated a statistically significant association. The test results showed that there was no association between increase in handwashing frequency and age or gender. Interestingly, the level of handwashing knowledge also did not affect handwashing frequency. Out of a total of 154 respondents, 95% revealed that they have been exposed to handwashing promotion programs during the pandemic. Furthermore, 74% felt that health promotion efforts had a positive effect on how often they washed their hands. This indicates that the current programs that encourage handwashing, such as the ones

distributed by WorkSafeBC and other government agencies, are effective (BCCDC, 2020; BCCDC, n.d.; CDC, 2020a; CDC 2020b; WorkSafeBC, 2020; HealthLink BC, 2020). In the knowledge quiz section, where participants were asked about the CDC recommended handwashing duration, 25% of respondents overestimated the 20 second rule (BCCDC, n.d.). However, whether or not they actually washed their hands for more than 20 seconds remains unclear. In the survey study conducted by Dickie et al., (2017) they discovered that female university students tend to wash their hands more often than male students. Unfortunately, the findings from this survey study cannot refute nor agree with that statement since no association was observed between gender and an increase in handwashing compliance.

Knowledge Translation

By incorporating the findings from this study into handwashing promotion initiatives, health authorities and other government agencies can ensure that their programs are directed to the appropriate audience for maximum efficiency. As discussed earlier, the data shows that Canadians are indeed washing their hands more often due to the pandemic. This indicates that people will be more capable of preventing infection and transmission of other communicable diseases that are spread by physical contact such as: salmonellosis, influenza and norovirus. The findings also show that a higher handwashing compliance is associated with higher education rather than gender and age. Therefore, handwashing promotion programs should be specifically tailored for different educational groups, regardless of their gender and age.

Limitations

Methodological Limitations

A major methodological limitation was the lack of survey responses. A higher response rate would provide more valid and more statistically robust results (personal communication [class lecture], 2020). A larger study population may also decrease beta error when conducting tests for inferential statistics (personal communication [class lecture], 2021). The short duration of survey availability further impacted the response rate.

Financial Limitations

Without sufficient funding to afford the premium version of SurveyMonkey, the author could not purchase targeted responses in order to reach a more specific audience and increase the response rate.

Social Limitations

Social distancing measures during the pandemic has also prevented the use of in-person surveys which would have gained higher

quality and more honest answers from the public.

Future Research

Future research projects could explore areas such as:

- Investigating the frequency of ABHR use due to the COVID-19 pandemic through online surveys
- Analyzing the changes in handwashing duration due to the COVID-19 pandemic through online surveys

Conclusions

Although Canada is currently experiencing its third wave of COVID-19 cases, an increasing number of Canadians are receiving their vaccinations, and eventually the pandemic will end. The findings from this study provide clear evidence that the pandemic has changed the behaviour of Canadians for the better in terms of handwashing compliance. As a result, the Canadian public will be able to prepare and effectively respond to future outbreaks of communicable diseases. Health authorities and other government agencies should continue to promote handwashing practices as a proactive approach to disease prevention and control. It may also be prudent to tailor health promotion programs for specific groups having lower levels of compliance.

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Competing Interest

The author declares that they have no competing interests.

References

- BC Centre for Disease Control [@CDCofBC]. (2020, June 1). Show kids how to wash their hands and prevent #COVID19 with this video and they can learn to be hand-washing heroes: <https://youtu.be/UitUdTjhZz8> via @GovCanHealth. [Thumbnail with link attached] [Tweet] Twitter. <https://twitter.com/CDCofBC/status/1267520057208438794>
- BC Centre for Disease Control. (n.d.). Hand washing. <http://www.bccdc.ca/health-info/diseases-conditions/covid-19/prevention-risks/hand-washing>
- Centers for Disease Control and Prevention. (2020a, February 11). Guidance for Healthcare Providers about Hand Hygiene and COVID-19. Hand Hygiene. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/hand-hygiene.html>
- Centers for Disease Control and Prevention. (2020b, September 9). When and How to Wash Your Hands | Handwashing | CDC. <https://www.cdc.gov/handwashing/when-how-handwashing.html>
- Dickie, R., Rasmussen, S., Cain, R., Williams, L., & MacKay, W. (2017, June 7). The effects of perceived social norms on handwashing behaviour in students. *Psychology, Health & Medicine*, 23(2), 154–159. <https://doi.org/10.1080/13548506.2017.1338736>
- Gupta, K. M., Lipner, S. R. (2020, May). Hand Hygiene in Preventing COVID-19 Transmission. *MDedge Dermatology*. <https://cdn.mdedge.com/files/s3fs-public/Gupta%202020%20CT105005233.pdf>
- HealthLink BC. (2020, September 17). Reduce Your Risk of Infection. <https://www.healthlinkbc.ca/covid-19/reduce-infection>
- Hirose, R., Ikegaya, H., Naito, Y., Watanabe, N., Yoshida, T., Bandou, R., Daidoji, T., Itoh, Y., & Nakaya, T. (2020, October 3). Survival of SARS-CoV-2 and influenza virus on the human skin: Importance of hand hygiene in COVID-19. *Oxford Academic*. <https://doi.org/10.1093/cid/ciaa1517>
- Knell, G., Robertson, M. C., Dooley, E. E., Burford, K., & Mendez, K. S. (2020, August 28). Health Behavior Changes During COVID-19 Pandemic and Subsequent "Stay-at-Home" Orders. *International journal of environmental research and public health*, 17(17), 6268. <https://doi.org/10.3390/ijerph17176268>
- Miller, A., (2020, October 17). How Canada failed to heed a key lesson from SARS when COVID-19 hit. *CBC*. <https://www.cbc.ca/news/health/coronavirus-canada-sars-1.5766021>
- Mukherjee, S., Vincent, C. K., Jayasekera, H. W., & Yekhe, A. S. (2020, September 17). Antiviral efficacy of personal care formulations against Severe Acute Respiratory Syndrome Coronavirus 2. *Infection, Disease & Health Journal*. <https://doi.org/10.1016/j.idh.2020.09.003>
- Mussa, I. (2020, March 11). Never mind COVID-19, half of you aren't even washing your hands after going to the bathroom. *CBC*. <https://www.cbc.ca/news/canada/ottawa/not-enough-people-wash-their-hands-regularly-says-microbiologist-1.5492517>
- NCSS 2021 Statistical Software (2021). NCSS, LLC. Kaysville, Utah, USA, [ncss.com/software/ncss](https://www.ncss.com/software/ncss).
- PICNet. (2020, September). Hand cleaning compliance in healthcare facilities, Q3 & Q4 of 2019/20, Provincial Hand Hygiene Working Group of British Columbia. https://www.picnet.ca/wp-content/uploads/PICNet_HCC_Report_Q34_2019-20.pdf
- Stiepan, D. (2020). COVID-19 expert explains what soap does to SARS-CoV-2 virus. *Mayo Clinic*. <https://newsnetwork.mayoclinic.org>

/discussion/covid-19-expert- explains-
what-soap-does-to-sars-cov-2-virus/
Webster, P., (2020, March 21). Canada and
COVID-19: learning from SARS: The
Lancet.
[https://www.thelancet.com/journals/lancet/article/PIIS0140-6736\(20\)30670-X/fulltext](https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(20)30670-X/fulltext)

WorkSafeBC. (2020, May). Help prevent the
spread of COVID-19: Handwashing.
<https://www.worksafebc.com/en/resource/s/health-safety/posters/help-prevent-spread-covid-19-handwashing?lang=en>

World Health Organization. (2020, July 9).
Coronavirus disease (COVID-19): How is
it transmitted?
<https://www.who.int/news-room/q-a-detail/coronavirus-disease-covid-19-how-is-it-transmitted>