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Original Article

The effect of lockdown following COVID-19 on the online pornography seeking and related behaviors among general population in India: An infodemiology study

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Abstract

India imposed a strict lockdown to control the spread of COVID-19 pandemic, which led to concerns expressed by the scientific community and lay media alikeabout the increased online pornography consumption and associated problematic pornography use among the people. However, this has not been systematically explored in the Indian context. The present study aimed to evaluate the online search interest for pornography seeking and help-seeking behavior among the Indian population before and during the first two phases of lockdown by conducting a Google Trends analysis of the relative search volume (RSV) for selected keywords. Our results showed that consumption of online pornography (as depicted by RSV for porn-seeking) was consistently higher than help-seeking for problematic pornography use (as depicted by RSV for help-seeking). Further, during the same time-period there was no peaking of the RSVs for help-seeking and neutral keywords. This can thus be interpreted that though there was a surge in porn-seeking behavior, consumers didn't appreciate it to be problematic in particular. Also, that it was not merely a reflection of increased internet traffic during the lockdown period. Our study also demonstrates the feasibility of using Google Trend analysis as a useful approach for conducting future research in a sensitive field like pornography.

Keywords: Pornography, Google trends, Lockdown, COVID-19, India

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Introduction

The World Health Organization (WHO) declared Corona Virus Disease (COVID-19) as a global pandemic on 11 March 2020 (Shah and Farrow, 2020). As a response to this crisis, governments of different countries

have introduced a series of steps aiming to control the spread of the pandemic. In this context, India imposed a strict nationwide lockdown for three weeks initially on 24 March 2020 after observing a 14-hour voluntary public curfew on 22 March (Pulla, 2020). However, in view of the rising trend of new COVID-19 cases at the end of first phase of lockdown, the government extended this lockdown till 3 May 2020 (second phase). Subsequently, the next two phases of lockdown witnessed significant relaxations in restrictions placed on the movement of people outside their homes for work or leisure, and other non-essential business activities resumed gradually. The fear regarding the impact of COVID-19 and concern about its potential negative impact on future is on a rise worldwide (Ornell et al., 2020). Additionally, during the first two phases of lockdown people had ample free time and limited sources of recreation while being confined to their homes practicing social distancing guidelines. Thus, a large proportion of people engaged in different activities over digital platforms (both online and offline). In this context, as pornography has become widely accessible due to the popularization of smart-phones and internet connectivity, the period of lockdown may be associated with an increased use of online pornography as a modality of entertainment or coping strategy to reduce the COVID-19 related anxiety and distress (Cocci et al., 2020; Du et al., 2020). There have been published reports of increased porn website traffic from Western countries like Spain, Italy during the pandemic (Orte, Ballester and Nevot-Caldentey, 2020). However, this has not been systematically explored in the Indian context. In a country like India, where porn consumption is considered as a sensitive issue associated with a risk of both legal and social complications, Google Trends analysis could be an important alternative to traditional self-report based research modalities to study the pornography seeking and other related behaviors in the population (Mondal and Mondal, 2020). Google Trends has been used as a reliable and valid method for monitoring web-based activity of the population (Nuti et al., 2014), and accurately predicting the pattern of actual behaviour in many other previous studies (Cavazos-Rehg et al., 2015; Höpken et al., 2019).

We aimed at conducting a Google Trends analysis of the selected keywords to examine the changes in online search interest for pornography seeking and related behaviors among the Indian population before and during the lockdown following the COVID-19 pandemic. We hypothesized that both online pornography consumption and problematic pornography use among Indian population would increase during the lockdown period.

Materials and methods

Data extraction

The Google Trend analysis was conducted to evaluate the online search interest for keywords representing porn-seeking and help-seeking behaviours of the population before and during the first two phases of lockdown in India. Google Trends utilizes an algorithm to give normalized relative search volume (RSV) for the keyword(s) searched for a specified geographical region and time period. The RSV represents how frequently a given keyword has been searched using the Google search engine, compared to the total number of Google searches conducted in the same geographical region over the selected time period. The RSV values range from zero (representing very low search volumes) to 100 (peak search volume for that query). The four Google Trends options of Region, Time, Category, and Search type were specified as India, past one year, all categories, and web search in the present study. The weekly RSV values for selected keywords for past one year were plotted on a

graph, and then downloaded on 31 July 2020 in separate .csv files using the below described search strategy.

Keywords are the search queries entered into search engine by the people in order to find something online. In order to determine which keywords individuals typically use to find pornography online, the internet service Word Tracker was used. It is a freely available online software (https://www. wordtracker. com), in which the seed word 'porn' was used to explore porn-seeking keywords. WordTracker then searched the top 100 websites that rank highest on the Google search engine for the term 'porn' in India. Additional keywords were extracted based on the suggestions obtained using the WordTracker software, which provided a list of other related search words being used by people searching for the keyword 'porn' online. Similarly, the seed word 'stop porn' was used for exploring help-seeking behaviour related keywords. Five keywords containing no domain specific or similar words were selected for both porn-seeking and help-seeking online behaviours. Additionally, a list of five neutral keywords was prepared to assess the non-specific increase in search volumes due to increased internet activity during the selected time period. The list was finalized prior to beginning of data extraction by the process of consensus building between all three authors (qualified psychiatrists with clinical and research experience) based on the face validity of selected search queries. The 'plus' (+) function from google trends was used to integrate the search volume (RSV) of all porn-seeking terms, help-seeking, and neutral keywords. The complete list of 15 keywords used in this study along with other details pertaining to the methodology is described in supplementary Table 1.

Ethics statement

The information used in this study involved data related to the volume of anonymized web searches made during a given time period, and was freely available in the public domain. Further, no patient or participant was approached directly in this study. Thus, no written ethical permission was required from the ethics committee.

Statistical analysis

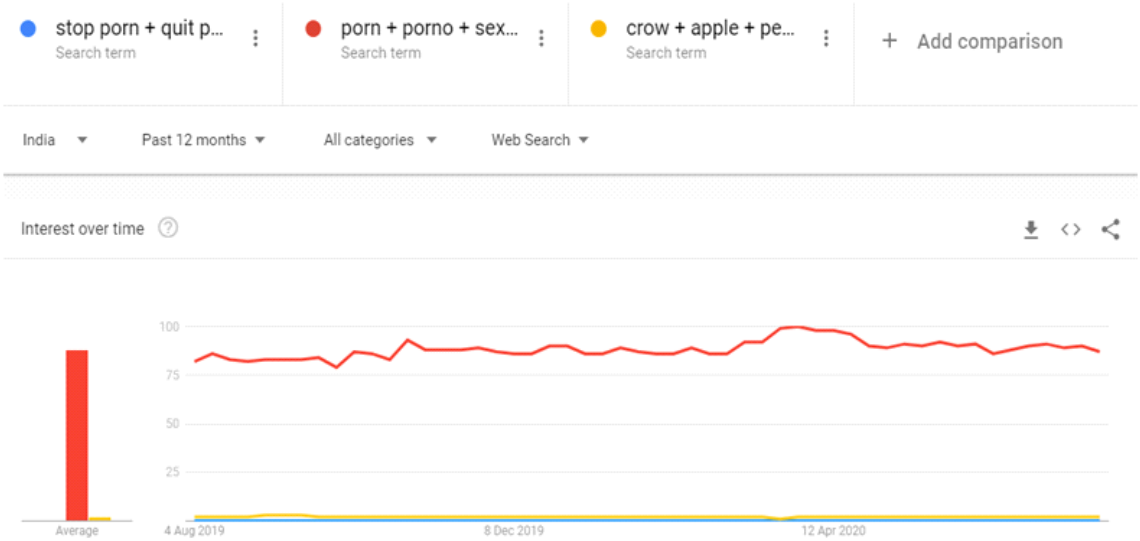
The Google Trends compare function was used to plot a graph showing comparative weekly variations in RSV for porn-seeking, help-seeking and neutral keywords for the past one year. Also, the weekly RSV values downloaded separately from Google Trends for porn-seeking and help-seeking keywords were entered into the Microsoft excel spreadsheet (Microsoft office for Windows, Version 2013, Redmond, USA). The weekly RSV values from 16 February 2020 till 2 May 2020 were used for further analysis. The data was transferred to Statistical Package for the Social Sciences software (SPSS for Windows, Version 23.0. New York, IBM Corp.). The first and second phase of lockdown period corresponded to 25 March- 14 April, 2020 and 15 April- 3 May, 2020 respectively. Google Trends for past one-year period gave weekly RSV values as depicted in supplementary Table 2. The time-frames which were most approximate representations of the first two phases of lockdown were included in the analysis. Thus,the data were divided into two-time frames representing the pre-lockdown (16 Feburary- 21 March) and the first two phases of lockdown (22 March- 2 May). The data were checked for normal distribution by using the Kolmogorov Smirnov test. The change in mean RSV value for the porn-seeking and help-seeking keywords before and during the lockdown was compared using the independent t-test. A two-tailed p-value of <0.05 was considered significant for all the tests.

Results

The comparative weekly variations in the online search interest for porn-seeking, help-

seeking and neutral keywords for the past one year are depicted in the Figure 1. The online search interest for porn-seeking was greater than help-seeking throughout the year, and the peak RSV values ranging between 98-100 were obtained for porn-seeking during the first three weeks of lockdown (i.e. first phase). Further, this did not occur with any corresponding changes in RSV for either help-seeking or neutral keywords (see supplementary Table 2). This suggests that the increase in RSV observed was not simply due to an increase in internet activity during the lockdown period.

Figure 1: Google Trends search plot comparing online search interest for porn-seeking (red colour), help-seeking (blue colour), and neutral theme (yellow colour) related keywords.



The change in online search interest for porn-seeking and help-seeking keywords is described in Table 1. There was a significant increase observed in the porn-seeking, but not the help-seeking online behaviour during the lockdown.

Table 1: Comparison of online search interest for porn-seeking and help-seeking keywords before and during the lockdown in India

Keywords	Before lockdown (Mean RSV ± SD)	During lockdown (Mean RSV ± SD)	Test statistic (p-value)
Porn-seeking	89.00 ± 2.82	97.00 ± 3.89	[a] 4.06 (0.002*)
Help-seeking	66.00 ± 6.69	73.66 ± 10.70	[a] 1.48 (0.16)
RSV: Relative search volume; SD: Standard deviation; [a] Independent t-test; *p-value< 0.05			

Discussion

Our study was an attempt to analyze the online search interest regarding pornography seeking and help-seeking behavior regarding pornography. We felt the need to conduct such a study was manifold. Problematic internet use and more specifically, pornography use has been shown to be increased in many studies during the course of the lockdown (Mucci, Mucci and Diolaiuti, 2020). Pre-print researches and lay media have extensively reported that pornography in various forms (like revenge porn, pornography involving child

characters, etc) were highly in demand for consumption (Deccan Herald, 2020; Orte, Ballester & Nevot-Caldentey, 2020). In such a scenario relying on a snow-ball technique may not be the best mode of research. To add to that published reports have acknowledged that recall bias and the lack of valid and culturally sensitive tools to study consumption of pornography are persistent hindrances in conducting research in this field. We believe that, using Google Trend analysis allows us to circumvent many of these issues.

Our results showed that consumption of porn (as depicted by RSV for porn-seeking) was consistently higher that help-seeking for problematic pornography use (as depicted by RSV for help-seeking). Overall, the highest RSV (between 98 to100) was obtained in the first phase of lockdown, which basically means that the searches in relation to porn-seeking were never as high in our study period as in the first phase of lockdown. During the same time there was no peaking of the RSV in help-seeking and neutral keywords. This can thus be interpreted that though there was a surge in porn-seeking behavior, consumers didn't appreciate that to be problematic, and it was not merely a reflection of higher internet traffic.

The increase in pornography consumption should be examined carefully in the light of the recently evolving information of sexual behavior in the lockdown period. Many studies report that libido and frequency of sexual intercourse increased during the period of lockdown (Arafat et al., 2020; Cocci et al., 2020). However, lockdown can also lead to a change in family dynamics and loss of privacy (due to more family members staying at home). Lockdown also negatively impacted the chances of indulging in partnered sexual activities. This can be even more significant in persons belonging to sexual minorities (e.g. homosexuals) or with major medical comorbidities which predisposed more rigorous restrictions (e.g. diabetes mellitus, bronchial asthma, etc). Increased pornography consumption could be a result of that. It should also be remembered that the study was conducted at a time when the Government of India has banned 827 pornographic websites, many of which are legal in the United States. However, the rise in RSV of porn-seeking keywords coincided with the announcement of few popular pornographic websites making their exclusive content freely available to the world, in order to allow homebound people effectively deal with the stress of lockdown.

The 'Challenge Hypothesis' proposed by Wingfield et al. (Wingfield et al., 1990) states that in the face of competition of a stressful situation, the testosterone levels of males tends to increase. From the evolutionary point of view, this was related to territorial fights and mate guarding. But, a modern interpretation of this hypothesis entails that males who can deal with challenges better tended to have a higher increase of serum testosterone (Archer, 2006). In the light of this concept, we can consider that increased porn-seeking is a reflection of hormonal changes happening in subjects in the face of the lockdown.

The most important strength of our study is that it is able to improve on the methodological hindrances that most published studies have faced in the field of pornography research (e.g.recall bias & lack of validated tools). Also the details provided in our study allow readers to repeat and reproduce the search, should they want. The important limitation of our study was that the list of keywords used were derived using a software and then consensus amongst the authors. The authors acknowledge that this may not be the most rigorous way to conduct this step of the study. Also, generalizability

of our findings is limited because readers may argue that users could have hidden their Internet Protocol (IP) address using Virtual Private Network (VPN). Similarly typing the porn-seeking keywords doesn't necessarily imply consumption of pornography.

Conclusion

To conclude, our study shows that during the period of lockdown, search for pornography had increased significantly, whereas there was no such trend observed for problematic pornographic consumption. Our study also proves that Google Trend analysis could be a useful tool in conducting research in a sensitive field like pornography. Future endeavors in this sector should involve using corroborating these findings with established data sets or using a mixed method approach. Further, Google Trend can also be used to identify geographical locations with high RSV and predict events putatively related to pornography use (e.g. sexual crimes).

Supplementary Table 1: Checklist for documentation of methodology for a GoogleTrends based study

Section/Topic	Checklist item	Details for present study
Search Variables:		
Access Date	Provide the date(s) when Google Trends was accessed and when the data was downloaded.	On 31 July 2020, we searched and downloaded data using Google Trends.
Time Period	Identify all the time periods that were searched for in Google Trends, providing up to the Month and Day in detail.	We searched within the "India" region using the "past 12 months" option in Google Trends.
Query Category	Identify which query category was used for search; if not using a query category, designate that "all query categories were used", which is the default setting.	The default option of "All categories" was used as porn related searches can span across multiple different categories.
Search Input:		
Full Search Input	Provide the full search input(s) that were queried for in Google Trends, along with the appropriate documentation of search syntax. Ensure that the provision of the search input is clear, using brackets or other delineators to separate the search input from the body text.	**Porn seeking keywords:** porn + porno + sex + erotica + xxx **Help-seeking keywords:** stop porn + quit porn + porn addiction + overcome porn + leave porn **Neutral keywords:** crow + apple + pencil + shirt + snow
Combination	If more than one search term was used, document whether those terms were used in combination with a plus sign (+), or if terms were excluded with a minus sign (-). If terms were not used in combination, state so clearly.	Plus sign (+) function was used to integrate RSV for different category of keywords.
Quotation Marks	If there was more than one word in any search term (e.g. "lipid guideline"), document whether those words were queriedwith quotation marks or not.	No quotation marks were used to keep the search broad and not restricted.
Rationale for Search Strategy:		
For Search Input	Provide the reasoning behind the choice of search input.	The search keywords were finalized using a strategy involving the use of WordTracker keyword planner software, and expert consensus approach based on the face validity of keywords for porn-seeking and help-seeking behaviours. Additionally, neutral keywords unrelated to porn and COVID-19 lockdown were chosen to account for the effects of increased internet activity during lockdown.
For Settings Chosen	Provide the reasoning for the settings/search variables chosen to specify the search.	The Google search for past one year in the geographical region of India was chosen to evaluate the changes in search interest for online porn-seeking and help-seeking behaviours at the population level before and during the first two phases of lockdown imposed in India.
This checklist is taken from the study: Nuti SV, Wayda B, Ranasinghe I, Wang S, Dreyer RP, Chen SI, Murugiah K. The use of google trends in health care research: a systematic review. PLoS One. 2014, 22;9(10):e109583. doi: 10.1371/journal.pone.0109583.		

Supplementary Table 2: Comparative changes in weekly relative search volume (RSV) for different keywords before and during the first two phases of the lockdown in India

Time-frame (in weeks)	Porn-seeking keywords	Help-seeking keywords	Neutral keywords
09-15 February	86	<1 [a]	2
16-22 February	89	<1	2
23-29 February	86	<1	2
01-07 March	86	<1	2
08-14 March	92	<1	2
15-21 March	92	<1	2
22-28 March	99	<1	1
29 March-04 April	100	<1	2
05-11 April	98	<1	2
12-18 April	98	<1	2
19-25 April	96	<1	2
26 April-02 May	90	<1	2
[a] RSV value of <1 means a very low search volume for help-seeking compared to porn-seeking keywords			

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