Responses to Reviewers for Art., titled "The pandemic and precocious puberty - a Google Trends study"

Reviewer #1:

[1]. *Methods section should be further expanded. Please use subheadings to carefully describe your data collection methodology, analysis plan, analysis tools, statistical tests utilized, etc.*

We thank the Reviewer for the suggestion. In the revised version of the manuscript we have expanded as follows:

"Data Collection

We collected, from Google Trends (https://trends.google.com), the searches for 21 PP-related keywords/search terms in English internationally. We chose keywords/search terms in English because in previous studies we have shown that with regards to Google Trends, the volume of internet searches in English is vastly larger than in any other language (and practically dwarfs searches in other languages. We limited the collection to the years 2017-2021 (Table 1). The years of the study were imposed by Google Trends' algorithms: these were changed, according to Google, on January 1st 2017 and then on January 1st 2022. Additionally, we assessed local searches for selected terms, in English and local languages, in countries where a rise in PP has been reported in the medical literature(Table 2). Google does not report absolute internet search volumes. Instead, Google gives the sum of each search in the form of Relative Search Volumes (RSVs). These RSVs are percentages relative to the peak search volume obtained during the specified time period and scaled by the total search volume for each specific search term. Consequently, these numbers do not represent absolute search volume numbers, but are normalized and presented on a scale from zero to 100.

Data Analysis

The collected searches (in RSV format) per each week were assessed vis-à-vis time (in weeks) and analyzed using Kendall's Tau test, with a statistical significance threshold of $p<0.05$, using JASP v.0.16.3 (JASP Team, University of Amsterdam, Netherlands, 2022)."

[2]. *The language at several places seems to be quite informal and would benefit from being more thoughtful. At several instances, it was felt that such language was contributing to a sense of overstatement. E.g. "It would be expected that a true increase in the incidence of PP would also be aptly reflected in Google Trends (after all, it is young people – particularly parents - who are concerned about PP and are particularly engaged with the internet)."*

Following the Reviewer's suggestion we have changed the text in the revised version of the manuscript as follows:
"The epidemiology of acute diseases (like influenza) or chronic diseases (like cardiovascular ailments) has been shown over the years to be reflected in associated and relevant internet searches, as they are gathered, summarized and reported in Google Trends. In an analogous way, it would be expected that a true increase in the incidence of PP would also be aptly reflected in Google Trends."

[3]. *Authors do not compare findings of their work with similar google trends based analysis done during COVID pandemic on related fields. They should do so.*

As suggested by the Reviewer, we have added the text below, and immediately following the revised text which addresses point [2]:
"Lending credence to the association between disease cases and internet searches, in 2020-2021, the officially reported cases of COVID-19 worldwide were positively associated with relevant Google Trends searches, as it has been shown in research works by our group as well by the work of other researchers."

[4]. A visual description (figure) of secular changes in trends (changes over time) would add value to the manuscript.

We thank the Reviewer for the suggestion. Two new original figures have been added to the revised version of the manuscript.

Reviewer #2

[1]. *Discuss few more factors which influences the search trends of any particular disease among general population apart from COVID-19 situation, mention it in the introduction section.*

In the revised version of the manuscript we added the following:
"Among adult internet users who look for specific health issues, approximately one in four has read or watched someone else's health experiences or medical issues in the last year; one in six is seeking others with the same health concerns. These behaviors are more prominent in caregivers and patients with chronic diseases."

[2]. *In the introduction section please discuss the physiological changes or challenges observed in male and female due to PP. Discuss in short how it may affect a society.*

In the revised version of the manuscript we added the following:
"Precocious puberty (PP) describes the changes which are associated with the transition to adult body habitus earlier than age 8 in girls and age 9 in boys. Children with PP may have a short final height, suffer from poor body image, low self-esteem, depression and anxiety and/or be plagued by problems in socialization (particularly with peers), sexuality and substance abuse."

[3]. *Usually a online consensus form can be circulated in facebook or any other popular social media site specifically in a region of a country to acquire the understanding of a population about a disease. In that online form researchers can seek for informations like the 'were you ever affected by PP' or 'any close friend or family member suffered from PP'. This type of method used for acquiring epidemiological information could be highly effective.*

In the revised version of the manuscript, we added at the end of the article the need and usefulness of an online tool to help with the epidemiology of PP as follows:

"For PP, its epidemiological profile is not clear worldwide, with vast differences across countries and continents, with some published reports in the medical literature presenting the incidence and others giving the prevalence of PP, adding to confusion. The "gold standard" to help in the diagnosis/differential diagnosis of PP is the gonadotropin-releasing hormone test. It is laborious and costly. Tools using readily and easily available data may be handy in the diagnosis and eventual management of PP. Additionally, there is a lack of validated instrument to assess the psychosocial impact of PP. Internet-based tools could fill this gap."

[4]. *Google search trends can be influenced by certain factors like a circulating video in social media platform as a government's initiative to increase consciousness on a disease. Once a educated viewer watches such video, chances are high that he/she study more in google regarding that disease. However such person would learn about the disease briefly not everything. Using google search trend deep searches on terms and websites informing correct and detail knowledge how many persons have studied online should be focused. Not just PP patient's parents perform google search to learn about the health consequences.*

We thank the Reviewer for this remark. Please see our answer to point [1]

[5]. *Google search trends and facebook online consensus form can be compared suggesting the population affected over a period of time within a given region over a period of time and the increase/decrease of awareness on that disease. At the same time literatures from the same region the number of studies published can be searched from google scholars to find the reported prevalence rate of a disease. In under developed regions, literatures can very poorly suggest prevalence rate of a disease.*

We thank the Reviewer for this remark. Please see our answer to point [3]

[6]. *Number of patients increase as per literatures and prevalence rate of a disease are two different facts. Check what is the prevalence rate and incidence rate of PP as per WHO refer that in the manuscript.*

The Reviewer is right that incidence and prevalence are different parameters. Unfortunately, for precocious puberty, its epidemiological profile is not clear worldwide, with vast differences across countries and continents, with some published reports in the medical literature presenting the incidence and others giving the prevalence of PP, adding to confusion. The latter was added to the paper's Discussion.

[7]. *Please discuss the factors causing the rising number of PP stated by literatures*

The Reviewer is correct in pinpointing this weakness. However, there are no clear causative factors for the reported rise in the incidence of precocious puberty - please see our answer to point [6]. We have added the following in the revised version of the manuscript.

"There are no clear causative factors for the reported rise in the incidence of precocious puberty. Excess sedentary lifestyle and rising obesity may play a role"

[8]. *Discuss about how the literatures on PP were acquired in methods section.*

We have added the following in the revised version of the manuscript:

"The PubMed database (https://pubmed.ncbi.nlm.nih.gov/) was searched, with no time limits. The search strategy, honed on the tentative effects of COVID-19 on precocious puberty, was as follows: "((precocious AND puberty) OR (early AND puberty)) AND COVID-19"."

[9]. *Core tip should be concise and short declaring aim and results/findings. Here introduction section is almost the size of core tip, this does not looks good.*

We thank the Reviewer for the comment. The core tip has been shortened in the revised version of the manuscript as follows:

"Recent publications, have reported that more young people are experiencing precocious puberty (PP) during the Covid-19 pandemic. Studies have shown that searches for diseases on the internet also reflect to some extent the epidemiology of these diseases. With this study we aimed to estimate, through relevant internet searches, changes in the epidemiology of PP. We assessed in Google Trends searches for PP-related terms in English internationally, and in English and local languages, in countries where a rise in PP has been reported, in the years 2017-2021. Over the study period more than half of the search terms showed little change or declined. The discrepancy between internet searches for PP and the reported increase in the literature is striking. If our findings are valid, then the literature may have been biased."

[10]. *As I can see that this study found that there is increase in disease incidence as per literatures at the same time there is rise in consensus among general population regarding PP. Why there is an increase among general people that authors can study the results obtained from google search trend to suggest about it.*

In this study we found that most internet searches on precocious puberty were prone to either show little change or wane over time, with some exceptions. We have no concrete explanation for this specific behavior.

[11]. *In abstract subheading 'discussion' term should be changed to conclusion.*

Revision reviewer:

I thank the authors for engaging in peer-review. While I have some reservations about the article, it is unlikely that the manuscript will improve further. It has some limitations and issues, despite which it seems appropriate for publication in this journal.

We thank the Reviewer for the comments provided. Indeed, we also consider that there are limitations in our work. We believe that these are adequately and appropriately addressed at the end of our article as follows: "There are limitations and caveats in our study. We collected only Google Trends data, but as far as the internet is concerned, Google searches outnumber those of any other search engine, reaching an impressive percentage of 95% worldwide (https://gs.statcounter.com/search-engine-market-share; accessed October 30, 2022). An exception to this is China, where the internet is searched with local search engines, albeit without a feature analogous to that of Google Trends. Moreover, we know that English-language searches outnumber searches in all other languages. Another limitation was the restrained choice of keywords in the searches; for the sake of homogeneity in the searches, the "related queries" feature of Google trends was not used. We did not evaluate for any periodicity because of the relatively short duration of pandemic. Medical research articles generate public interest when reported by news outlets; Google searches are easily influenced by media items. For the duration of the study no such interest was discernible, since the relevant medical articles on increased incidence of PP appeared in 2022, after the end of this study's time period."

This was changed in the revised version of the manuscript per the Reviewer's suggestion.