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BIBLIOMETRICS

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STRATEGIES DEVELOPED TO ASSESS ADHERENCE TO TUBERCULOSIS TREATMENT: A BIBLIOMETRIC ANALYSIS

Estratégias desenvolvidas na avaliação da adesão ao tratamento da tuberculose: uma análise bibliométrica

Estrategias desarrolladas para evaluar la adherencia al tratamiento de la tuberculosis: un análisis bibliométrico

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ABSTRACT

Objective: to analyze the frequency of words correlating with the title and abstract of the scientific production on the strategies for assessing adherence to tuberculosis treatment, in the light of Zipf's Law. **Method:** study of bibliometric analysis, through the databases SCOPUS, LILACS, BDENF, MEDLINE and IBECS. The descriptors tuberculosis, patient refusal to treat, medication adherence, educational technology and validation study of articles published in the last twenty years were used. **Results:** 41 documents were identified, the tag clouds made it possible to identify the correlation between the text segments based on the frequency of the words 'treatment', 'patient', 'tuberculosis' and 'adherence'. In the descriptive analysis of the content, the terms are associated with health and interventions with devices that involve technology. **Conclusion:** the titles and abstracts showed a relationship with the topic addressed, but the bibliometric indicators indicate directions and existing gaps on the scientific production of tuberculosis adherence.

DESCRIPTORS: Tuberculosis; Medication adherence; Bibliometrics.

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RESUMO

Objetivo: analisar a frequência de palavras correlacionando com o título e resumo da produção científica sobre as estratégias de avaliação da adesão ao tratamento da tuberculose, à luz da Lei de *Zipf*. **Método:** estudo de análise bibliométrica, por meio das bases de dados SCOPUS, LILACS, BDENF, MEDLINE e IBECS. Utilizou-se os descritores tuberculose, recusa do paciente ao tratamento, adesão à medicação, tecnologia educacional e estudo de validação de artigos publicados nos últimos vinte anos. **Resultados:** foram identificados 41 documentos, as nuvens de tags possibilitaram identificar a correlação existente entre os segmentos de texto a partir da frequência das palavras 'tratamento', 'paciente', 'tuberculose' e 'adesão'. Na análise descritiva do conteúdo os termos associam-se a saúde e intervenções com dispositivos que envolvem a tecnologia. **Conclusão:** os títulos e resumos mostraram relação com o tema abordado, porém os indicadores bibliométricos indicam direcionamentos e lacunas existentes sobre a produção científica da adesão à tuberculose.

DESCRITORES: Tuberculose; Adesão à medicação; Bibliometria.

RESUMEN

Objetivo: analizar la frecuencia de palabras que se correlacionan con el título y el resumen de la producción científica sobre las estrategias para evaluar la adherencia al tratamiento de la tuberculosis, a la luz de la Ley de Zipf. **Método:** estudio de análisis bibliométrico, a través de las bases de datos SCOPUS, LILACS, BDENF, MEDLINE e IBECS. Se utilizaron los descriptores tuberculosis, rechazo del paciente al tratamiento, adherencia a la medicación, tecnología educativa y estudio de validación de artículos publicados en los últimos veinte años. **Resultados:** se identificaron 41 documentos, las nubes de etiquetas permitieron identificar la correlación entre los segmentos de texto a partir de la frecuencia de las palabras 'tratamiento', 'paciente', 'tuberculosis' y 'adherencia'. En el análisis descriptivo del contenido, los términos se asocian a salud e intervenciones con dispositivos que involucran tecnología. **Conclusión:** los títulos y resúmenes mostraron relación con el tema abordado, pero los indicadores bibliométricos indican direcciones y vacíos existentes sobre la producción científica de la adherencia a la tuberculosis.

DESCRIPTORES: Tuberculosis; Cumplimiento de la medicación; Bibliometría.

INTRODUCTION

Tuberculosis became the leading cause of death from infectious diseases in the world in 2015, when it overtook HIV infection.[1] Primarily, it is understood that the discussion of the aspects surrounding tuberculosis is essential to emphasize the factors favorable or not to treatment adherence, a crucial element to the well-being and longevity of people living with the disease. There is evidence that tuberculosis (TB) is a major public health problem worldwide, with an estimated 9.6 million incident cases annually.[2] Therefore, it is vital to discuss the interventional proposals developed worldwide in an attempt to assess therapeutic compliance in this pathological condition.

TB is an ancient disease, found even in mummies, caused by Mycobacterium tuberculosis, better known as Koch's bacillus. Its initial symptoms are similar to the flu, which later evolves and can lead to death. It is also categorized as a reemerging disease, given its potential for dissemination and the constant increase in cases, especially in areas with vulnerable socioeconomic conditions. Therefore, it is a worrying obstacle to public health care in Brazil, since it is one of the 30 countries with a high burden of tuberculosis (TB), according to the World Health Organization (WHO).[3] In 2020, Brazil registered 66,819 new cases of TB.[4]

From this perspective, the challenges faced by health professionals in trying to provide efficient treatment throughout the prescribed period come into play. Standard treatment requires satisfactory adherence and requires a complex combination of drugs divided into two phases: [2] months in the intensive phase and 4 months in the continuation phase, which can extend up to 24 months for patients with multidrug-resistant bacteria (MDR).[2] However, precisely because it requires a prolonged interval and rigor for the success of the care process, many individuals end up abandoning the indicated measures.

Consequently, it is possible to observe cases of disease prevalence, a fact that leads to the alarming reality of drug resistance. This problem is associated with the inefficiency of health services, especially regarding the capacity for early detection of new cases and unfavorable outcomes such as treatment failure and treatment abandonment.[5]

Low medication compliance for infectious diseases such as TB results in continued infectiousness as well as poor clinical outcomes. Therefore, such a negative evolution can cause not only a delay in the performance of the health professionals involved, but is also capable of triggering more frustration for a person already destabilized by the disease. Therefore, the need for a strategic support network becomes evident, aiming, through the promotion of innovative alternatives, to contemplate each affected individual in his or her biopsychosocial sphere.[6]

In addition, there is the current pandemic scenario being experienced by COVID-19. Considering that tuberculosis represents one of the main public health problems in Brazil and that COVID-19 is a global health emergency, it is necessary to identify strategies for better management of these two infectious diseases of the respiratory tract in the world, especially in Brazil.[7] An international study reveals that the risk of death was 2.17 times higher in patients with tuberculosis and COVID-19 than

in patients with COVID-19 alone.[8] Reducing TB incidence and controlling the disease are essential goals for The end TB.

Based on this understanding, studies addressing aspects related to therapeutic adherence to TB are necessary, since it is a communicable disease with potential mortality. Thus, knowing the strategies adopted in the literature to measure it is capable of favoring the planning of preventive actions and treatment, guaranteeing the cure of the pathology. It is also justified by the relevance of the theme in the area and the incipient number of studies on the subject, especially in Brazilian literature. Based on this assumption, the present study aims to analyze the frequency of words correlating with the title and abstract of the scientific production on strategies for assessing adherence to tuberculosis treatment, in light of Zipf's Law (frequency of words).

For this study, we formulated the following guiding question: What is the frequency of words correlating with the title and abstract of the scientific production on interventions validated and developed to assess adherence/risk of noncompliance to treatment of patients diagnosed with tuberculosis that go beyond the proposal of directly observed treatment (DOTS)?

It is also worth noting that WHO calls for intensified research and innovation, including the rapid adoption of new tools, interventions and strategies with the potential to dramatically change TB outcomes in remote regions. These technologies can strengthen TB control activities within challenging national TB treatment and control programs (NTPs) and can be adapted to address other public health challenges. The deployment of innovative technologies needs to be tailored differently to context-specific factors.[8]

METHOD

This is a descriptive study with a quantitative approach that used the bibliometric analysis method. Bibliometrics contributes statistically to evaluate trends in the growth of production, publication, authorship and use on a given subject researched in various areas of knowledge.[9]

Bibliometrics has laws, the main ones being: Bradford's law (productivity of journals), Lotka's law (productivity of authors) and Zipf's law, used for the study in question, which consists of measuring the frequency of appearance of words in various texts, creating an order of frequency of terms of a given theme or subject.[8]

To this end, this study followed a few steps: research objective, research protocol, data collection, data analysis, and summary of results. The first stage of this bibliometric study consisted of defining the topic, the objective, and the guiding research question, presented in the introduction. In the second stage, composed of the research protocol, we defined the databases, the keywords, the Boolean operators and the search strategy. Scopus (Elsivier) was used: "tuberculosis" AND "treatment refusal" OR "medication adherence" AND "educational technology" OR "validation study"; LILACS, BDENF - Nursing, MEDLINE and IBECS: "tuberculosis" AND "patient refusal to treatment" OR "medication adherence" AND "educational technology" OR "validation study".

In the third stage, data collection, the eligibility criteria were listed and applied. These included: accessibility of the selected papers in their entirety, thematic relevance, publication in the last twenty years, English, Spanish, and Portuguese languages, and equivalence to the study objective. Traditional literature reviews, secondary studies (systematic review), letter-answer, documentaries, and editorials were excluded. Also in this step, the database was built using the Excel® program (version 2016).

For this, the authors developed a script for data collection, including the following variables: language, year of publication, name of the journal, authors with the highest number of production in this study, location of institutional affiliation, type of article, descriptors and/or keywords, theme studied, and abstract of each study. Data collection was carried out in the month of December 2020.

After data collection, with a total of 68 documents retrieved, all abstracts in English and Spanish were translated into Portuguese, read in full so that they could be organized and analyzed using IRAMUTEQ software, which was chosen to perform word frequency analysis - following Zipf's Law.

Seventeen manuscripts were eliminated, because the abstracts did not contemplate the theme under analysis. Then, in a second reading, 10 more abstracts were suppressed because they did not contain concise information regarding the primary elements: objective, methodology, results, and conclusion.

During the fourth stage, the corpus was prepared, according to the criteria of the IRAMUTEQ software, with the 41 recovered documents whose abstracts were in accordance with the pre-established criteria. Subsequently, the Objective subcorpus, Methodology subcorpus, Results subcorpus, and Conclusion subcorpus were made and analyzed by the IRAMUTEQ software, which processes different types of textual data analysis, namely, Classical Textual Statistics, Group Specificity Search, Descending Hierarchical Classification (DHS), Similarity Analysis, and Word Cloud; each one presents specific characteristics and reflections.[10] Word Cloud analysis and Similarity analysis were chosen for the study.

It is important to note that the research respected the ethical and legal principles established in Law n. 12,853, of August 14, 2013, which provides for the collective management of copyright.[11]

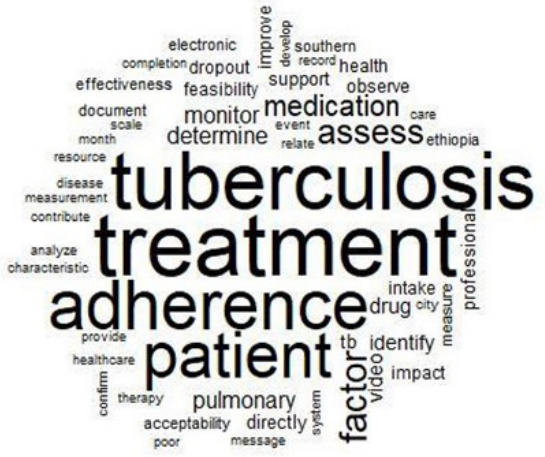
RESULTS

It was observed that most of the articles were published in the years from 2008 to 2019, corresponding to 29 (70.7%) of the productivity. As presented in Table 1, the description of the Corpus is observed, according to text segmentation, word occurrence, number of words and number of hapax from the analysis of the objective, methodology, results and conclusion.

As expressed, Figure 1 shows the word cloud of the Objective Subcorpus. In it, one can notice a connection between the most cited inducing terms 'tuberculosis' and 'treatment' associated with

'adherence', 'patient' and related to the verbs 'evaluate', 'determine', 'identify'. It is evident the interaction between the highlighted words, which favor the achievement of the study's objective.

Figure 1 – Objective Word Cloud. Recife, PE, Brazil, 2020



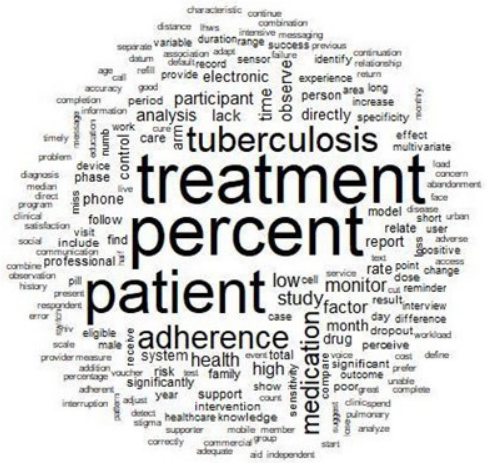
Source: elaborated by the authors, 2020.

As for the ranking of terms extracted from the Corpus of the methodology, it was observed that patients, treatment, and tuberculosis occupy the first three places, respectively with the following frequencies: 59; 40; and 38. Accordingly, in fourth order, study had a frequency of 33; followed by data 26; and adherence 23. The terms medium and health both occupied the seventh order, as they obtained the same number of frequency, 20. Finally, the eighth order went to the term use, with frequency 19.

Following the word order, in Figure 2, which is about the analysis of the results, we notice that the words "percent," "treatment," "patient," "tuberculosis," and "adherence" stand out compared to the other words, but that these are interconnected with the words "medication," "study," "analysis," among others. It is clear this association in the tag cloud and its relevance within the investigated material, because it is known that the words found answer the objective and are interconnected to the theme in question, consequently.

In figure 3, the word tree is presented in the interface at the conclusion of the similarity analysis or tag cloud, identifying the occurrences among the words and indicating the connection between the terms 'treatment', 'adherence', 'patient', 'tuberculosis', 'health', and 'improve', helping to identify the structure of the

Figure 2 – Word cloud Results. Recife, PE, Brazil, 2020



Source: elaborated by the authors, 2020.

representational field of factors associated with strategies to evaluate adherence to tuberculosis treatment.

Figure 4 shows that in the first sphere the words "treatment", "patient", "tuberculosis" and "adherence" stand out, with frequencies of 237, 213, 174 and 143, respectively. Then come the words percent, health, study, and medication, which appear 103, 73, 67, and 55 times, respectively. It is noticeable the importance that these terms have within its scope, since these words are correlated with the title and abstract.

DISCUSSION

Zipf's Law allows the segregation of a small set of words that occur many times from another large set of words with small frequency, and can be applied in the automatic indexing of scientific publications through the quantification in terms of word frequency.12 From this, it becomes possible to identify the most prevalent topics that are related to the researched theme, as well as the most relevant ones, called hot topics.[13]

The general corpus was made up of four texts, separated into 278 text segments (ST), occurrences 11,399 and number of 2,342 words and the number of hapax 1303 - 55.64% of the words.

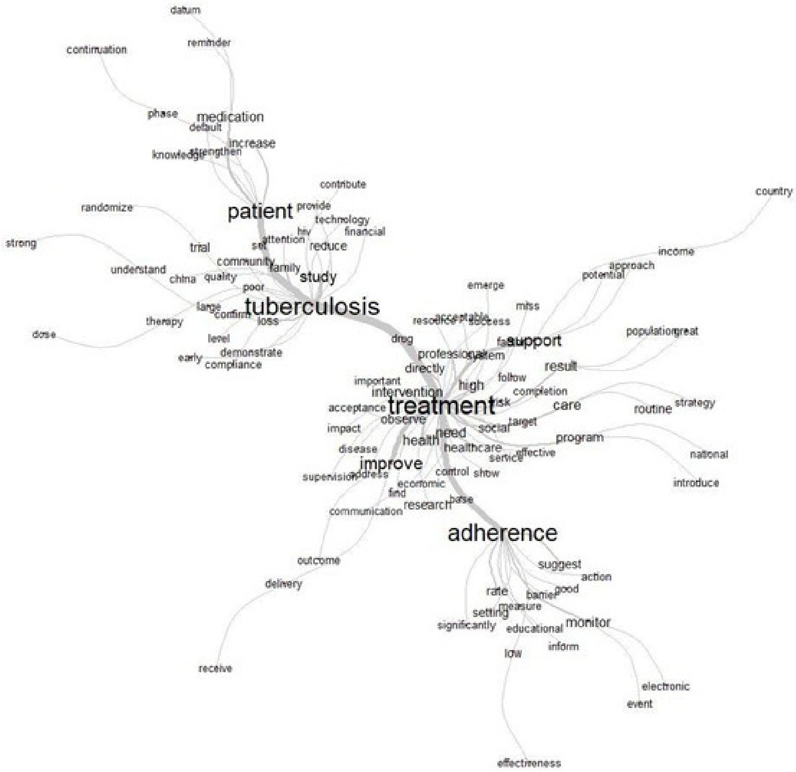
It must be said that the analysis performed from the "word cloud" or "tag cloud" is visually interesting. Its importance is justified by the ease of understanding, since the structure of

Table 1 – Corpus Description, Recife, Brazil. 2020

Analysis	Text Tracking	Word occurrences	Number of words	Hapax Number *
Goal	29	1194	395	283
Methodology	82	3375	1050	686
Results	106	4337	1277	839
Conclusion	61	2493	787	519
Total	278	11399	3509	2327

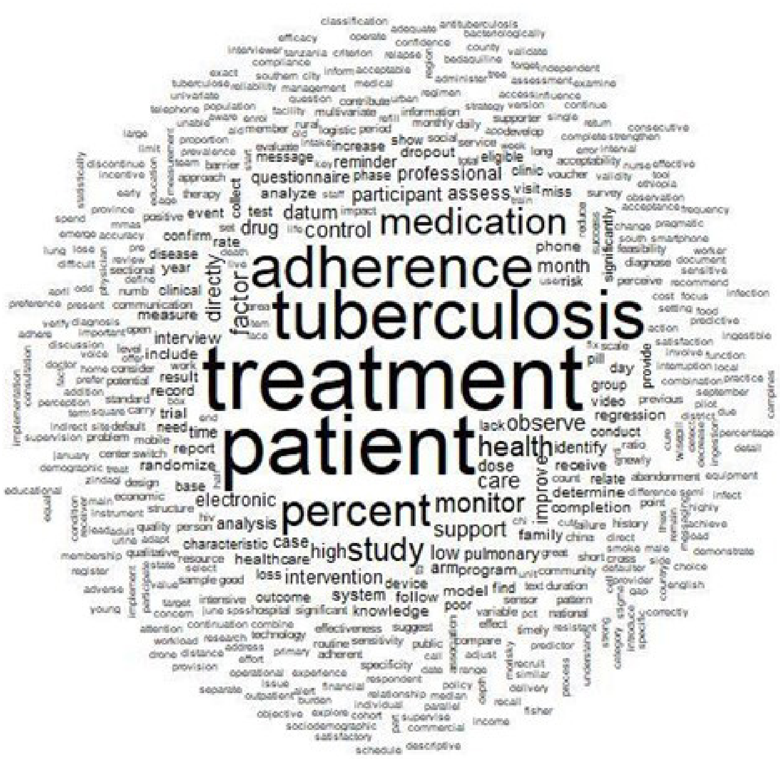
***Hapax:** number of words that appear only once.

Figure 3 – Similarity Graph Conclusion. Recife, PE, Brazil, 2020



Source: elaborated by the authors, 2020.

Figure 4 – General Corpus word cloud. Recife, PE, Brazil, 2020



Source: elaborated by the authors, 2020.

the words in the form of a cloud ensures the segregation into different sizes, in which the largest words are those that have a higher degree of importance in the text corpus.

The tag clouds also made it possible to clearly identify the existing correlation between all text segments through the frequency of the words 'treatment', 'patient', 'tuberculosis' with health.

In this sense, the literature reveals that the adherence process is not only an act of personal decision. The broader the understanding and the perception of the subject about his health-disease process, the greater his possibility of involvement in resoluteness, which makes him amenable to changes, consequently, making it easier for him to adhere to treatment. In addition, for the success of the tuberculosis treatment, the patient must be encouraged to engage in self-care, even in the face of adversity. Obtaining favorable results in the health context is a challenge that must be accepted by any professional who believes that adherence to tuberculosis treatment is possible, as well as reflecting on self-knowledge and the perception of the need for individual health care.[14]

In the Brazilian context, strategies aimed at TB control and treatment are capillary in the Unified Health System (SUS). In the scope of services, informative, preventive, and care actions are listed, namely: standardized clinical procedures, immunization, identification of respiratory symptoms, laboratory procedures offering sputum tests and testing for the Human Immunodeficiency Virus (HIV), surveillance system, biosafety actions, and service organization.[15]

As a low-cost intervention, follow-up consultations and provision of directly observed treatment (DOT) are a potent bet for public policies aimed at combating TB. However, the proposal of DOT still needs to strengthen the logic with a matrix support involving specialized professionals and the surveillance center, forming a continuum of processes involved in decentralization.[16] Although this strategy is different because it provides an opportunity for a unique approach, it only covers users living in areas assigned by Basic Health Units. Despite considerable progress, dropout rates remain high.[15]

Infrastructure, stigma, and insufficient resources still represent major challenges for TB control in several regions of the world. Community health workers (CHWs) are known to play an extremely important role in TB surveillance. However, lack of time, (co-)responsibility, or even insufficient knowledge are factors that can compromise this work, resulting in weaknesses for TB control.[17]

The bibliometric study highlighted in the general corpus terms such as "monitor", "electronic", "intervention", and "medication". It is in this context that the survey of bibliometric indicators carried out in this study found that several studies have been developed to aid and encourage patient adherence to TB treatment, which have also used technological tools to monitor adherence. It is noteworthy that the largest scientific production using technology comes from the Asian continent, especially China, which already produces cutting-edge equipment that can reliably measure the daily intake of drug therapy. The findings in health contribute significantly to the provision of research data for the conduct of health care worldwide.

With this it can be seen that as an innovative strategy, technologies can strengthen TB control activities within the challenging national TB treatment and control programs (NTPs) and can be adapted to address other public health challenges. The deployment of innovative technologies needs to be tailored differently to context-specific factors. The Drone Observed Therapy System (DrOTS) project was launched in Madagascar in 2017 and integrates a package of innovative technologies including drones, digital adherence monitoring technology, and mobile device-based educational videos to support TB control.[17]

Medication reminder and remote treatment adherence monitoring devices, such as the evriMED pillbox, can increase treatment adherence and facilitate more effective allocation of limited health staff resources in settings where populations are hard to reach or health systems are under-resourced.[18]

While the potential of new digital technologies to transform health is enormous, this potential depends on user and context--specific needs, trade-offs with digital health technologies and strategies, and may imply different impacts and challenges in different settings.[19]

The Brazilian scientific community has accompanied the magnitude of the importance of discussions about TB control. For the first time in decades, novelties are appearing in the diagnostic and therapeutic fields: rapid molecular tests, new drugs developed specifically for the treatment of TB, numerous preventive and therapeutic vaccines under development, new shortened regimens being tested in multicenter clinical trials, in short, in a scenario always so lacking in novelty, hope is beginning to bloom.[15]

In this sense, researchers can benefit from bibliometric analysis techniques, because these studies contribute to the dissemination of an approximate reading of reality, and with the inclusion of more in-depth studies, the richness of the analyses becomes more representative. Finally, bibliometric studies can contribute to the visualization of the connections between information from various areas of knowledge.[20]

CONCLUSION

Based on the results, it can be seen that, among the 41 articles analyzed, there was a prevalence of research whose approach is directly related to the theme of drug adherence to TB treatment.

It can be seen that Zipf's theory, used in the study, made it possible to approach the development of research in a given field, besides providing a more modern view of the scientific production available in online journals, in which the abstracts revealed fundamental aspects for a broad understanding of the theme under study.

With the nursing field in mind, it is expected that the findings of this review may arouse the interest of researchers for the development of studies that address this theme, since they play a crucial role in the development of interventions that favor the National Plan for the End of Tuberculosis as a Public Health

Problem, which includes among its goals the 95% reduction in the incidence of tuberculosis in the world by 2030. Thus, further research on TB treatment adherence is suggested.

REFERENCES

1. World Health Organization (WHO). Global tuberculosis report 2015. [Internet]. 2015 [cited 2021 jan 11]. Available from: https://apps.who.int/iris/bitstream/handle/10665/191102/9789241565059_eng.pdf?sequence=1&isAllowed=y.
2. Woimo TT, Yimer WK, Bati T, Gesesew HA. The prevalence and factors associated for anti-tuberculosis treatment non-adherence among pulmonary tuberculosis patients in public health care facilities in South Ethiopia: a cross-sectional study. BMC Public Health. [Internet]. 2017 [cited 2021 fev 23];17(269). Available from: https://doi.org/10.1186/s12889-017-4188-9.
3. Bartholomay P, Pelissari DM, Navegantes WA, Yadon ZE, Heldal E. Qualidade da assistência à tuberculose em diferentes níveis de atenção à saúde no Brasil em 2013. Rev. Panam. Salud Publica. [Internet]. 2016 [acesso em 23 de fevereiro 2021];39(1). Disponível em: https://iris.paho.org/bitstream/handle/10665.2/28195/v39n1a2-por.pdf?sequence=5&isAllowed=y.
4. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Boletim Epidemiológico - Tuberculose 2021 [Internet]. Brasília: Ministério da Saúde [acesso em 17 de dez 2021]. Disponível em: https://www.gov.br/saude/pt-br/media/pdf/2021/marco/24/boletim-tuberculose-2021_24.03.
5. Barros DBM, Costa JMBS, Reis YAC, Albuquerque AC, Felisberto E. Avaliação da coordenação do cuidado de usuários com tuberculose multidrogarresistente em Recife, Pernambuco, Brasil. Saúde Debate. [Internet]. 2020 [acesso em 05 de março 2021];44(124). Disponível em: https://doi.org/10.1590/0103-1104202012407.
6. Molton JS, Pang Y, Wang Z, Qiu B, Wu P, Rahman-Shepherd A, et al. Prospective single-arm interventional pilot study to assess a smartphone-based system for measuring and supporting adherence to medication. BMJ Open. [Internet]. 2016 [cited 2021 mar 11];6(e014194). Available from: doi:10.1136/bmjopen-2016- 014194.
7. Silva DR, Mello FCQ, D'Ambrosio L, Dalcomo MP, Migliori GB. Tuberculose e COVID-19, o novo dueto maldito: quais as diferenças entre Brasil e Europa? J. Bras. Pneumol. [Internet]. 2021 [acesso em 02 de abril 2021];47(2). Disponível em: https://dx.doi.org/10.36416/1806-3756/e20210044 1/8.
8. Sy KTL, Haw NJL, Uy J. Previous and active tuberculosis increases risk of death and prolongs recovery in patients with COVID-19. Infect Dis (Lond). [Internet]. 2020 [cited 2021 abr 01];52(12). Available from: https://doi.org/10.1080/23744235.2020.1806353.
9. Fonseca EN. Bibliometria: teoria e prática. São Paulo: Cultrix; 1986.
10. Camargo BV, Justo AM. IRAMUTEQ: um software gratuito para análise de dados textuais. Temas psicol. [Internet]. 2013 [acesso em 26 de fevereiro 2021];21(2). Disponível em: http://dx.doi.org/10.9788/TP2013.2-16.
11. BRASIL. Lei n. 12.853, de 14 de agosto de 2013. Altera os arts. 5º, 68, 97, 98, 99 e 100, acrescenta arts. 98-A, 98-B, 98-C, 99-A, 99-B, 100-A, 100-B e 109-A e revoga o art. 94 da Lei nº 9.610, de 19 de fevereiro de 1998, para dispor sobre a gestão coletiva de direitos autorais, e dá outras providências. Portal da Legislação: Leis Ordinárias. 2013. Disponível em: http://www.planalto.gov.br/ccivil_03/_ato2011-2014/2013/lei/l12853.htm.
12. Guedes VLS. A bibliometria e a gestão da informação e do conhecimento científico e tecnológico: uma revisão da literatura. Ponto de Acesso. [Internet]. 2012 [acesso em 08 de março 2021];6(2). Disponível em: https://periodicos.ufba.br/index.php/revistaici/article/view/5695.
13. Ceretta GF, Reis DR, Rocha AC. Inovação e modelos de negócio: um estudo bibliométrico da produção científica na base Web of Science. Gest. Prod. [Internet]. 2016 [acesso em 20 de março 2021];23(2). Disponível em: https://doi.org/10.1590/0104-530X1461-14.
14. Temoteo RCA, Carvalho JBL, Santos VEP, Sousa YG, Medeiros SM. Adesão ao tratamento da tuberculose: uma perspectiva do cuidado de si foucautiano. Reme, rev. min. enferm. [Internet]. 2018 [acesso em 15 maio 2021];22(e-1118). Disponível em: http://www.dx.doi.org/10.5935/1415-2762.20180053.
15. Ministério da Saúde (BR). Secretaria de Vigilância em Saúde. Manual de recomendações para o controle da tuberculose no Brasil [Internet]. Brasília: Ministério da Saúde; 2019 [acesso em 18 de mar 2021]. Disponível em: http://www.aids.gov.br/pt-br/pub/2019/manual-de-recomendacoes-para-o-controle-da-tuberculose-no-brasil.
16. Junges JR, Burille A, Tedesco J. Tratamento diretamente observado da tuberculose: análise crítica da descentralização. Interface (Botucatu). [Internet]. 2020 [acesso em 15 de abril 2021];24(e190160). Disponível em: https://doi.org/10.1590/Interface.190160.
17. Nouvet E, Knoblauch AM, Passe I, Andriamiadanarivo A, Ravelona M, Ramtariharisoa FA, et al. Perceptions of drones, digital adherence monitoring technologies and educational videos for tuberculosis control in remote Madagascar: a mixed-method study protocol. BMJ Open. [Internet]. 2019 [cited 2021 mar 19];9(e028073). Available from: 10.1136/bmjopen-2018-028073.

18. United Nations International Children's Emergency Fund (UNICEF). Vanuatu announces drone trial participants to assess vaccine delivery in remote islands. [Internet]. 2017 [cited 2021 abr 22]. Available from: https://reliefweb.int/report/vanuatu/vanuatu-announces-drone-trial-participants-assess-vaccine-delivery-remote-islands

19. Subbaraman R, Mondesert L, Musiimenta A, Pai M, Mayer KH, Thomas BE, et al. Digital adherence technologies for the management of tuberculosis therapy: mapping the landscape and research priorities. BMJ Glob Health. [Internet]. 2018 [cited 2021 fev 25];3(e001018). Available from: https://gh.bmj.com/content/3/5/e001018.

20. Silva VRF, Cheng C, Silva CRL, Marta CB, Garcia AS, Vicentini SC, et al. Análise bibliométrica da produção científica sobre Coronavírus e Covid-19. Saude Colet. [Internet]. 2020 [acesso em 15 de maio 2021];10(53). Disponível em: https://doi.org/10.36489/saudecoletiva.2020v10i53p2356-2369.