

Evaluation of the accuracy of the information on websites about visceral leishmaniasis: a strategy for countering information disorder

Avaliação da acurácia da informação em sites sobre leishmaniose visceral: uma estratégia de enfrentamento da desordem informacional

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ABSTRACT New Information and Communication Technologies are increasingly present in the daily lives of people and institutions globally. The information they convey may need to be updated, complete, correct, or deliberately untrue. We live in a context of information mayhem. Health-related information like this can harm individuals and society. Some alternatives have been put forward to address this issue. This article discusses how online health information quality assessment and website certification can serve in confronting information disorder. It presents a methodology for assessing the accuracy of online information following the updated and scientifically proven information from evidence-based medicine. It analyzes the case of visceral leishmaniasis: one of the most prevalent neglected diseases in the world. Following this method, a tool with indicators was built, and the websites of international non-governmental organizations and the Ministries of Health of Brazil and India were evaluated. The results show that all the evaluated websites obtained at most 50% compliance with the indicators used.

KEYWORDS Online access to information. Internet portal, patient. Evaluation study. Leishmaniasis, visceral. Neglected diseases.

RESUMO As novas Tecnologias de Informação e Comunicação estão cada vez mais presentes no cotidiano de pessoas e instituições em nível global. As informações que elas veiculam podem estar desatualizadas, incompletas, incorretas ou deliberadamente mentirosas. Vive-se um contexto de 'desordem informacional'. Na saúde, uma informação como essa pode causar dano ao indivíduo e à sociedade. Algumas alternativas têm sido apresentadas para enfrentar esse problema. Este artigo discute como a avaliação da qualidade da informação sobre saúde on-line e a certificação de sites podem servir para o enfrentamento da 'desordem informacional'. Ele apresenta uma metodologia de avaliação da acurácia da informação on-line seguindo as informações atualizadas e cientificamente comprovadas pela medicina baseada em evidências. Analisa o caso da leishmaniose visceral: uma das doenças negligenciadas mais prevalentes no mundo. Seguindo esse método, foi construída uma ferramenta com indicadores e foram avaliados sites de organizações não governamentais internacionais e dos Ministérios da Saúde do Brasil e da Índia, países nos quais a leishmaniose visceral é endêmica e que concentram grande parte dos casos mundiais da doença. Os resultados revelam que nenhum dos sites avaliados obteve mais de 50% de conformidade com os indicadores utilizados.

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PALAVRAS-CHAVE Acesso à informação on-line. Portais do paciente na internet. Estudo de avaliação. Leishmaniose visceral. Doenças negligenciadas.



Introduction

Digital media are pervasively present in the daily lives of people and institutions globally¹. The large volume of information they convey may need to be updated, complete, incorrect, or with the deliberate intention of misleading the interlocutors in a context of ‘informational disorder’². Wardle and Derakhshan² present this concept, as they consider the expression ‘fake news’ imprecise to describe the phenomena related to the pollution of information in which it is immersed. These authors affirm that this ‘informational disorder’ would be subdivided into three types, namely:

Dis-information. Information that is false and deliberately created to harm a person, social group, organization, or country. Mis-information. Information that is false but not created to cause harm. Mal-information. Information that is based on reality and used to inflict harm on a person, organization, or country²⁽²¹⁾.

In health, information with these characteristics can affect well-being or cause harm to individuals and society. On the other hand, quality online information from a reliable, up-to-date, scientifically based, and understandable source can play a fundamental role in self-care practices, lower service costs, disease prevention, and health promotion. Citizens will know and possibly adopt the preventive measures recommended by science with it. They will be able to know where, when, and why to perform certain diagnostic tests and receive possible and necessary medical care. Thus, assessing the quality of health information available on the internet can be one of the strategies to combat ‘informational disorder’³.

One of the methods for carrying out this assessment is based on establishing a set of criteria and indicators. Criteria are standards that underpin evaluation. Each consists of indicators that measure the degree of compliance between the information made available and considered correct and adequate in each criterion⁴.

Paolucci and Pereira Neto⁵ identified five criteria most used to assess the quality of information on health websites from a systematic review. These criteria were already identified by Eysenbach et al.⁶ and Zhang, Sun, and Xie⁷ in their respective systematic reviews. The first criterion is technical: it observes, for example, whether responsibility and reference are attributed to the information provided and whether the sites’ creation and updating dates are provided. The design criterion assesses whether the layout and colors facilitate navigation in the virtual environment. The scope verifies whether the site has all the topics relevant to the theme addressed. Readability is the criterion that assesses the understanding level of the text available online⁸. Information accuracy was defined by Eysenbach et al.⁶ as the observation of the degree of agreement between the information offered in the virtual environment and the best evidence generally accepted by medical practice.

Paolucci, Pereira Neto, and Nadanovisky⁹ found that the criterion that assesses information accuracy is widely used by studies that propose to assess the quality of health information on the internet. They concluded that the authors of the studies used the consensus among specialists in the study area or the reliable scientific bibliographical production to evaluate the information’s accuracy. None of these systematic reviews identified a study that had resorted to scientific evidence systems or evidence-based medicine to construct health information accuracy indicators.

Paolucci, Pereira Neto, and Nadanovisky⁹ propose that the indicators for evaluating the accuracy of the information available on health websites be based on the best and most current scientific evidence available, updating the definition by Eysenbach et al.⁶ for the criterion. To this end, they recommend employing the theoretical Pyramid 5.0 model of evidence-based health care to identify evidence and pre-evaluated guidelines. This model follows the reflections introduced by Alper and Haynes¹⁰, who suggest a five-level evidence organization model.

The first level would include empirical studies on a particular theme or health problem. They present results hard to generalize, as they are limited to analyzing specific cases. The second includes systematic reviews, which are investigations conducted on a wide range of scientific papers, with predefined methods to systematically identify problems and relevant results published on an issue or topic. The systematic review verifies the quality of these works, extracts the data, and synthesizes the results. In this case, the conclusions can be generalized better. The third level includes systematically derived recommendations (guidelines), a set of rules or guidelines on a particular subject. They aim to establish a standard of conduct in the face of concrete problems. The fourth level of the pyramid includes the synthesized summaries for clinical reference, which should serve as a reference for clinical practice as they provide updated evidence summaries. It is the most appropriate level in the search for practical guidelines for evidence-based health care¹¹.

According to Paolucci¹¹, who evaluated online information sources, DynaMed Plus is currently the best tool for seeking evidence-based guidance. It is a platform developed by EBSCO, an American database company, which aims to provide synthesized summaries for clinical reference in English. It stands out for its quality and way of displaying the results¹¹. Its main objective is to provide health professionals, researchers, and students with quality health information based on updated evidence, easily located in the database. Access to the platform is not free: it is necessary to pay an annual subscription to access the available content, the amount of which varies according to the user's profile.

Considering this setting, this paper assesses the accuracy of online information on visceral leishmaniasis. To this end, indicators were built from the best and most current scientific evidence available on DynaMed Plus about this disease.

Visceral leishmaniasis was chosen because it is a neglected disease. This parasitic disease mainly affects the poorest populations and is associated with social inequality and low funding from the pharmaceutical industry. It is one of the most prevalent neglected diseases in the world, where more than 1 million new cases are identified annually. It is an endemic disease in 76 countries. However, more than 90% of the global cases occur in India, Bangladesh, Sudan, South Sudan, Ethiopia, and Brazil. In 2019, Brazil concentrated 97% of disease cases in Latin America. It can cause death if untreated, constituting an essential public health problem^{12,13}.

Online information quality indicators were used to assess the content on visceral leishmaniasis available on four websites: two from international Non-Governmental Organizations (NGOs) and two linked to the Brazilian and Indian Ministries of Health, respectively – two of the six countries with the highest incidence of the disease¹³. The present study is, therefore, part of the field of 'misinformation' as mentioned by Wardle and Derakhshan², as sites linked to institutions with international credibility that play a relevant and recognized role in the field of health will be evaluated. However, their information may be outdated, incomplete, or incorrect, although not intended to cause harm.

The page dedicated to leishmaniasis on the Doctors Without Borders (MSF) website was selected because it offers open-access informative content about the disease in Portuguese and is from an internationally recognized non-profit organization. Furthermore, it aims to provide health care in areas with humanitarian crises and raise public awareness of such situations (<https://www.msf.org.br/o-que-fazemos/atividades-medicas/leishmaniose>).

Choosing the NGO Drugs for Neglected Diseases initiative (DNDi) page for evaluation followed a logic similar to the previous choice. We selected this page because it

offers free informative content in Portuguese about leishmaniasis. It is an internationally recognized organization that aims to develop safe, effective, and affordable treatments for millions of vulnerable people affected by neglected diseases (<https://www.dndial.org/doencas/leishmanioses>).

Thus, selecting would facilitate the identification of the accuracy level of the information provided in Portuguese by organizations that are, to some extent, associated with the issue of visceral leishmaniasis. Choosing the Brazilian Ministry of Health page for evaluation was related to the search to identify the accuracy level of the information provided by a governmental body in one of its official communication channels. The Brazilian Ministry of Health has the 'Health from A to Z' website, a glossary in which open access information is presented in Portuguese on prevention, symptoms, diagnosis, and treatment of prevalent Brazilian diseases and the main themes, actions, public policies, and prevention and health promotion programs of the Brazilian government. It contains a link dedicated exclusively to visceral leishmaniasis, selected for the accuracy assessment (<https://www.gov.br/saude/pt-br/assuntos/saude-de-a-a-z/l/leishmaniose-visceral>).

Finally, we selected the Indian government open-access website on leishmaniasis available in English. We aimed to identify the accuracy level of the content provided by a governmental body in one of the countries most affected by the disease worldwide. The website was designed, developed, and hosted by the Center for Health Informatics (CHI) under the National Institute of Family Health and Welfare (NIHFW), an agency of the Ministry of Health and Family Welfare (MoHFW) of India (<https://www.nhp.gov.in/disease/kala-azar-leishmaniasis>).

The sites selected for analysis are, thus, associated with recognized institutions, which have, in different ways, an essential international role in leishmaniasis in two

countries that are among the most affected by this disease globally. Due to their public recognition, internet users can access their electronic addresses to obtain information about this disease. These sites can be seen as credible sources of health information due to their institutional affiliation.

We shall present how the indicators were constructed and which indicators will compose the tool used for evaluation next. Then, we shall discuss the results obtained in evaluating the selected sites and their relationship with coping with "informational disorder"²⁽¹⁰⁾.

Methods

This study started with constructing a tool to assess the accuracy of the visceral leishmaniasis information. After this stage, the available content about the disease was evaluated on the four sites chosen for analysis.

The visceral leishmaniasis page available on DynaMed Plus (<https://www.dynamed.com/condition/visceral-leishmaniasis>) was used as a reference to build the evaluation tool. This page is structured in different sections, which address different dimensions of the disease. Indicators were built to assess information accuracy from its data. These were grouped into four dimensions of the health-disease process¹⁴: prevention and control, symptom and diagnosis, transmission, and treatment. The set of indicators made up the evaluation tool.

The evaluation stage consisted of verifying whether the information displayed in the indicators, built from the synthesized summaries, is available on the evaluated sites classified as follows: complete, incomplete, erroneous, or absent. Thus, this paper presents two results: the proposed evaluation tool that can be used in assessing online environments on visceral leishmaniasis and evaluation of the four sites conducted in January and February 2022.

Results

Evaluation tool

Initially, observe the construction process of the transmission indicators. The following text is found in the 'Transmission' section on the Visceral Leishmaniasis page of DynaMed Plus:

Female phlebotomine sandflies are the only vector for transmission. Noiseless, 2-3 mm long arthropods (about one-third the size of mosquitoes). [...] Most active from dusk to dawn, although some species are active during daylight hours. [...] dogs serve as the main reservoir for *Leishmania infantum* (also known as *Leishmania chagasi*)¹⁵.

The information on the transmission of leishmaniasis available on DynaMed Plus was transformed into six indicators, namely:

- The female sandfly is the only known transmission vector for leishmaniasis;
- This transmitting insect is most active from dusk to dawn, although some species are present during the day;
- This transmitting insect has the color of sand (sandfly);
- This transmitting insect is silent;
- This transmitting insect measures 2-3 millimeters, much smaller than a mosquito;
- Dogs are the primary source of infection (reservoir).

The sections 'History and Physical' and 'Diagnosis' of the Visceral Leishmaniasis page of DynaMed Plus were consulted to build the symptoms and diagnostic indicators. The following information is included regarding clinical symptoms:

Infection may be asymptomatic. If present, symptoms may develop weeks to years after the sandfly bite. Typical signs and symptoms include fever, anorexia, weight loss, abdominal fullness, and tenderness [...]. Illness may progress over weeks to months¹⁵.

Regarding the clinical diagnosis, the DynaMed Plus page informs that splenomegaly (increased spleen) and hepatomegaly (increased size of the liver) are 'consistent signs and symptoms'. This content about symptoms and diagnosis was transformed into the following indicators:

- *Leishmania sp.* may be asymptomatic;
- Symptoms may take weeks or even years to become evident after being bitten by the transmitting insect;
- Typical symptoms of the disease include fever, loss of appetite (anorexia), weight loss, loss of sensation, and swelling in the abdominal region, especially the spleen, and liver;
- The disease can progress over weeks or even months.

The following information on prevention and control in endemic areas was located in the 'Prevention and Tracking' section of the DynaMed Plus page:

[...] avoid outdoor activities in endemic areas, especially from dusk to dawn; minimize exposed skin by wearing long-sleeved shirts and long pants while outdoors; if possible, use insecticide repellents on skin and clothing; if sleeping area not adequately screened or air-conditioned, use bed nets with holes small enough to prevent the entry of sandflies (most effective if treated with insecticide)¹⁵.

[...] in areas with endemic transmission control canine urban reservoirs mosquito-proof meshes in dog kennels insecticide-impregnated dog

collars serological surveying of dogs (humane euthanasia may be indicated if positive) residual insecticide spraying environmental sanitation¹⁵.

DynaMed Plus content refers to prevention and control in endemic areas. The above information served as the basis for the following indicators:

In endemic areas:

- Avoid outdoor activities, especially from dusk to dawn;
- Wear long-sleeved pants and shirts when outdoors;
- Use repellents on your skin and clothes;
- Use mosquito nets with holes small enough to prevent the entry of the transmitting insect if the sleeping area does not have a screen or air conditioning. Screens are most effective if treated with insecticides;
- Vaccinate dogs and use insecticide-impregnated collars;
- Perform canine euthanasia in positive cases;
- Spray walls with residual action insecticide for environmental sanitation.

DynaMed Plus includes the following information regarding the treatment size:

Treatment should be guided by expert consultation. Treatment decisions may vary by infecting species, geographic location, local resistance pattern, patient characteristics, and availability of medications. All patients should be treated to treat visceral leishmaniasis [...]. Liposomal amphotericin B is generally considered the first line due to a higher cure rate and lower side effect profile compared to older agents¹⁵.

The following indicators were built for the treatment of leishmaniasis from this information:

- A doctor must supervise the treatment;
- Treatment may vary according to the infecting species, geographic location, the possibility of the parasite resisting the drug administered, the patient's characteristics, and the availability of drugs;
- Liposomal Amphotericin B is the first-line medication adopted for patients with leishmaniasis due to its higher cure rate and a lower rate of side effects than other previously used drugs.

A tool consisting of 20 indicators was created, 6 for transmission, 4 for symptoms, 7 for prevention and control, and 3 for treatment. This list could be much higher if other updated and scientifically proven information had been included by evidence-based medicine in DynaMed Plus.

For example, information regarding the different transmitting mosquito species, the vector's behavior by region of the planet, and the parasite incubation period were not incorporated. Moreover, information on transmission through blood transfusion, intrauterine, bone marrow, solid organ transplantation, and needle sharing still needs to be transformed into indicators in the abovementioned tool. They were excluded because they are less common, according to DynaMed Plus. Some specific symptoms were not turned into indicators. In this case, the most available content for constructing indicators was restricted. DynaMed Plus also mentions different aspects to be evaluated during the clinical and laboratory test to make the diagnosis, besides detailed information on the drug treatment of the disease. This information was not transformed into indicators because it is technical and is intended, above all, for health professionals rather than for the general population.

The list of indicators could be even greater if a topic on breeding sites for the transmitting insect had been included. According to Benallal et al.¹⁶, mosquito vectors reproduce in an environment with decomposing organic matter or in animal breeding grounds. The 'Visceral Leishmaniasis Surveillance and Control Manual' from the Brazilian Ministry of Health¹⁷ considers this information crucial for prevention and control in endemic areas and guidance in environmental management. However, an indicator containing this information was not included in the evaluation tool, as this topic is not identified in DynaMed Plus.

The 20 indicators in the tool gather what can be considered primary data, that

is, information that every site on visceral leishmaniasis should include.

Evaluation result

The results will be presented following the abovementioned indicators, according to the four dimensions defined for leishmaniasis. We observed whether the correct and current information obtained through DynaMed Plus was complete (C), incomplete (I) or erroneous (E), or even if it was absent (A). Each answer was scored to better verify the result of the evaluation. Complete information received 10 points; incomplete ones, 5 points; and the absent or erroneous ones were not scored. The results of the transmission dimension are shown in *table 1*.

Table 1. Transmission information accuracy results

Indicator	MSF	DNDi	MOH/BR	MOH/IND
The female sand fly is the only transmission vector of leishmaniasis.	A	E	C	A
This insect is most active from dusk to dawn, although some species are active during the day.	A	A	A	A
The mosquito's color is sand (sandfly).	I	I	C	C
The mosquito is silent.	A	A	A	A
The insect measures 2-3 millimeters, much smaller than a mosquito.	A	A	I	C
The dog is the main source of infection (reservoir) for the transmitting insect (vector).	A	A	C	-
Transmission (60)	5	5	35	20
Percentage	8%	8%	58%	33%

Source: Own elaboration.

Complete (C); Incomplete (I); Erroneous (E); Absent (A).

The MSF website states that the disease is transmitted 'through the bite of infected sandflies'. The Ministry of Health of India website informs that 'sandflies are small insects, about a quarter the size of a mosquito'. The DNDi page indicates that transmission is carried out by the 'bite of different species of sandfly insect vectors'. In the first two environments, the female gender of the transmitting insect are not shown, although its subfamily (phlebotomine) is mentioned.

The Brazilian Ministry of Health website only highlights that the transmitting insects are small without comparing them with the size of mosquitoes or informing their approximate size. None of the four sites highlights the silent, nocturnal behavior of the insect.

According to the last report on the control of leishmaniasis published by the World Health Organization in 2010¹⁸, dogs are the main reservoirs of visceral leishmaniasis. The document emphasizes that the control of canine

visceral leishmaniasis is a task that must be adapted according to the local situation due to its complexity. Although less than half of infected dogs show signs of leishmaniasis, most of those called asymptomatic were infective for sandflies by xenodiagnosis. According to Donato et al.¹⁹, these characteristics justify the importance of euthanasia of infected, symptomatic, and asymptomatic animals to control transmission, especially when considering the low parasitocidal efficacy of drugs used to treat dogs with visceral leishmaniasis.

Visceral leishmaniasis is endemic in Brazil, other countries of the American continent, and Mediterranean countries, and *Leishmania infantum* is the etiological agent. In these regions, dogs are reservoirs of the parasite in

an urban setting. However, in India, visceral leishmaniasis caused by *Leishmania donovani* is an anthroponosis; humans are considered the only source of infection for vector sandflies; therefore, dogs are not reservoirs. For this reason, this indicator was not considered in this case¹⁵. However, it seems surprising that there is no basic information about the transmitting insect on the Indian government website.

In the transmission dimension, compliance would be obtained if the evaluated site obtained 60 points, 10 points in each of the six indicators. In this first dimension, the results indicate low levels of compliance, especially between the websites of the two NGOs (table 1). Table 2 presents the results of the assessment in terms of symptoms and diagnosis.

Table 2. Symptoms and diagnosis information accuracy results

Indicator	MSF	DNDi	MOH/BR	MOH/IND
Leishmaniasis infection can be asymptomatic.	A	A	A	A
Symptoms can take weeks or even years to surface after a mosquito bite.	E	E	A	A
Typical symptoms of the disease include fever, loss of appetite (anorexia), weight loss, swelling in the belly region (spleen and liver), and loss of sensation.	E	I	I	I
The disease can develop over weeks or even months.	A	A	A	A
Symptoms and Diagnosis (40)	0	5	10	5
Percentage	0%	12%	25%	12%

Source: Own elaboration.

Complete (C); Incomplete (I); Erroneous (E); Absent (A).

The four web pages evaluated do not mention the disease's possible asymptomatic condition. The MSF website states that the disease 'manifests itself two to eight months after infection'. The DNDi website informs that 'the incubation period is 10 to 14 days'. Both pieces of information need to be corrected according to DynaMed Plus parameters. This information needs to be included in the other two virtual environments.

Regarding typical symptoms, the MSF website mentions that they 'demand tissue, lymph nodes, or spinal cord samples'. This information needs to be corrected if we follow DynaMed Plus parameters. The DNDi website contains an engraving that indicates 'prolonged fever, spleen, and liver enlargement, substantial weight loss, and anemia' as symptoms of the disease. The Brazilian Ministry of Health website includes weakness and reduced muscle

strength and does not mention anorexia as a symptom of leishmaniasis. For this reason, this indicator needed to be completed.

None of the four sites informs the time of disease progression. MSF, DNDi, and the Brazilian Ministry of Health websites warn that the disease can be fatal if left untreated. The temporal evolution of the disease was absent in the four virtual environments.

In the symptoms and diagnosis dimension, full compliance would be obtained if the evaluated site obtained 40 points, 10 points in each of the four indicators. In this second dimension, the results indicate extremely low compliance rates in all evaluated sites. *Table 3* shows the evaluation results regarding prevention and control in endemic areas.

Table 3. Prevention and control information in endemic areas accuracy results

Indicator	MSF	DNDi	MOH/BR	MOH/IND
Avoiding outdoor activities, especially from dusk to dawn.	A	A	A	C
Wear long-sleeved shirts and pants when outdoors.	A	A	A	C
Use repellents on skin and clothing.	A	A	I	C
If the sleeping area does not have a screen or air conditioning, use mosquito screens with holes small enough to prevent the straw mosquito from entering. Screens are most effective if sprayed with insecticides.	A	A	A	C
Dogs must wear collars impregnated with insecticide.	A	A	C	-
Canine euthanasia may be indicated in positive cases.	A	A	C	-
Insecticide spraying should be used for environmental sanitation.	A	A	C	C
Prevention and Control in Endemic Areas (70)	0	0	35	50
Percentage	0%	0%	50%	71%

Source: Own elaboration.

Complete (C); Incomplete (I); Erroneous (E); Absent (A).

None of the websites of the two NGOs display information about the behaviors that residents of endemic areas should adopt. The Brazilian Ministry of Health website provides two short videos on how to collar dogs with insecticide. It also mentions dog euthanasia. However, the website warns that this initiative ‘must be integrated with the other actions recommended by the Ministry of Health’. Superficially, using repellents ‘when necessary’ and ‘comfortable clothes and closed shoes’ is recommended. For this reason, this indicator was considered absent.

In the prevention and control dimension, compliance would be obtained if the evaluated

site obtained 70 points. The information available on the Indian Ministry of Health website on this topic aligns with the assessment tool’s indicators for this dimension. However, the website only scored 50 points. This exceptionality is related to the fact that it is an anthroponosis in India, whereby dogs are not reservoirs of the parasite for the insect vector. For this reason, information on collar use and dog euthanasia would not be expected to appear on the website of the Ministry of Health in that country. *Table 4* shows the results of the assessment in the dimension of treatment of leishmaniasis.

Table 4. Treatment information accuracy results

Indicator	MSF	DNDi	MOH/BR	MOH/IND
Treatment for leishmaniasis must be supervised by a specialist doctor.	A	A	A	C
Treatment may vary according to the infecting species, geographic location, local resistance pattern, patient characteristics, and drug availability.	A	A	A	A
Liposomal Amphotericin B is the first line of medication adopted for patients with leishmaniasis due to its higher cure rate and lower rate of side effects.	I	A	A	I
Treatment (40)	5	0	0	15
Percentage	12%	0%	0%	37%

Source: Own elaboration.

Complete (C); Incomplete (I); Erroneous (E); Absent (A).

Only the Indian website mentions the doctor's presence in the treatment. The information displayed on the website appears 'indicative'; it is suggestive or serves as a sign of something. Furthermore, it concludes by stating: 'you should see your doctor for the diagnosis and treatment'. None of the sites mention the possibility of treatment being different according to some variables. The information that Liposomal Amphotericin B is the first-line medication adopted for patients with leishmaniasis due to its higher cure rate and a lower rate of side effects is not explicitly found on any of the websites.

The MSF website states that 'pentavalent antimonials are normally the first-line drug group'. The website of the Indian Ministry of Health shows the 'drugs available for treatment' and lists Sodium Stibogluconate, Pentamidine Isethionate, Amphotericin B, Miltefosine, and Liposomal Amphotericin B. For this reason, this information was considered incomplete on these two sites as it does not highlight Liposomal Amphotericin B as a first-line drug due to its higher cure rate and a lower rate of side effects.

The DNDi website states that patients with visceral leishmaniasis 'need an oral, effective, safe, low-cost and short-term treatment' without mentioning drug treatment. The Brazilian Ministry of Health website does not focus on treating this disease. He only informs that, 'although serious, visceral leishmaniasis has treatment for humans. It is free and available in the Unified Health System (SUS) service network'.

In the treatment dimension, compliance would be obtained if the evaluated site scored 40 points. All of the sites reached a score of 15. This number suggests that primary information about the treatment of the disease in the analyzed virtual environments has low accuracy or needs to be present.

Table 5 gathers the results of the four previous tables. The first column refers to each of the evaluation dimensions. The second presents the total possible points if the information were per the indicators built with DynaMed Plus. The following columns display the results of each site evaluated in the four dimensions. In the end, the results were transformed into proportional indicators.

Table 5. Visceral leishmaniasis information accuracy results

Indicator	Total	MSF	DNDi	MOH/BR	MOH/IND
Transmission	60	5	5	35	20
Symptoms and Diagnosis	40	10	5	10	15
Prevention and Control in Endemic Areas	70	0	0	35	50
Treatment	30	5	0	0	15
Total Points	200	20	10	80	100
Percentage		10%	5%	40%	50%

Source: Own elaboration.

Final considerations

The study elaborated on some crucial issues in communication and health information. How can citizens identify the insect that transmits the disease if the Brazilian Ministry of Health website only highlights that it is small without providing further details? How can citizens prevent this disease if none of the four sites highlights the silent and nocturnal behavior of the transmitting insect? How can citizens know whether or not they are infected if information about the typical disease symptoms is practically missing from the four websites? Citizens living in endemic areas and accessing one of the websites of the two NGOs will not retrieve the information necessary to prevent and take care of themselves properly, as there needs to be more information on how to behave in this epidemiological context.

If they access the Brazilian Ministry of Health website, citizens' fate will be similar, as they will not be oriented to avoid outdoor activities and wear pants and long-sleeved shirts.

As noted above, the information on visceral leishmaniasis in four critical virtual environments had low compliance rates concerning the scientific knowledge presented in the summarized abstracts for clinical reference, arranged in DynaMed Plus. In this case, most of the information made available is incomplete, erroneous, or absent, although the websites are linked to reputable institutions. We could not say whether the inaccurate information

provided by these four sites was deliberately intended to deceive. However, the sites evaluated in this paper do not provide correct information. Erroneous or incomplete information can be the basis for misinformation, clearing the way to circulate false information.

Other studies^{3,4,8,20,21} with similar objectives reached the same conclusions. That is, this problem is not a privilege of this or that site or this or that disease or health problem. The quality of information on health websites is a problem identified in different virtual environments, a severe problem that should be addressed.

Another noteworthy issue

Eysenbach²² mentions four strategies he calls 'pillars' for coping with false information. Although the target of this study was the accuracy of the information and not the deliberately misleading contents, the statements by Eysenbach²² also contribute to thinking about the issue of informational disorder and the circulation of imprecise, outdated, or inaccurate information about health. The first coping pillar suggested by the author aims to facilitate and strengthen the accurate translation of knowledge from one audience to another. He says:

These knowledge translation processes are, perhaps, the main mechanisms where information becomes misinformation, as the

interpretation of 'facts' is subject to multiple potentially influencing factors such as politics, commercial interests, selective reporting, and misunderstandings²²⁽³⁾.

The second pillar aims to refine and filter knowledge and verify facts. Eysenbach²²⁽⁴⁾ says,

on the science level, peer reviewing and publishing scholarly work is a method to constantly filter, refine, and improve the information generated by previous scholars.

The third pillar is geared toward building 'eHealth literacy'. The author argues that 'the user bears a significant part of the responsibility for selecting and filtering reliable health information' in the information age.

The fourth pillar refers to 'infoveillance': surveillance capable of "detecting outbreaks of misinformation, rumors, falsehoods, to counter them with facts or other interventions"²²⁽⁴⁾.

While not explicitly mentioned, assessing the quality of information could be included in the second pillar, as it aims to refine and improve the information offered. Assessing the accuracy of health information available on the web is a global challenge, the importance of which has become even more evident with the COVID-19 pandemic.

This paper aimed to present an innovative method for assessing the accuracy of the information available on health websites. In the first aspect, innovation is associated with how similar evaluations have been conducted. The second innovative aspect is related to the fact that this work did not evaluate following the viewpoint of experts or manuals but based on evidence-based medicine. The evaluation method proposed here can be adapted to assess information content about other diseases and health conditions, which can bring meaningful results about the accuracy of the information that circulates online about other health topics.

Two initiatives have stood out globally regarding assessing online health information quality: Health On Net Foundation ([\[www.hon.ch/en/\]\(http://www.hon.ch/en/\)\) and Discern \(<http://www.discern.org.uk/>\). The former is a Swiss NGO that certifies health websites based on eight principles. Discern is an initiative of the University of Oxford. It is a questionnaire consisting of 16 questions, which provides users with a valid and reliable way to assess the quality of information available on a health website. None of these initiatives verifies the accuracy of the information; they need to check the level of agreement between the online content and the most current and correct scientific evidence.](https://</p>
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Finally, an evaluation such as the one presented is not punitive but diagnostic. It allows managers of virtual environments to modify the content of the information made available or include other missing information. The same site would be re-evaluated later. The site will receive a certification if the information provided complies with the indicators. When searching on a certified website, the citizen would be confident that that information would be current and scientifically based. The certification of health websites by institutions of recognized respect by society is a strategic option to face the 'informational disorder'² because certified sites would be the informational environment that users could trust.

Collaborators

Pereira Neto A (0000-0003-3631-8857)* contributed to the conception and planning of the study; data analysis and interpretation; preparation of the draft and critical review of the content; participation in the approval of the final version of the manuscript. Ferreira E (0000-0002-4073-6704)* and Barbosa L (0000-0002-7341-260X)* contributed to data analysis and interpretation; preparation of the draft, and critical review of the content; participation in the approval of the final version of the manuscript. Paolucci R (0000-0003-3986-1118)* contributed to the critical review of the content and approval of the final version of the manuscript. ■

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