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Knowledge level of Medical students at Universidade Santo Amaro regarding the identification and management of dengue

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ABSTRACT

OBJECTIVE

To understand the level of knowledge of medical students at Santo Amaro University (UNISA) regarding the clinical presentation, diagnosis, management, and prevention of the disease.

METHODS

Descriptive study using a structured online questionnaire (Google Forms), applied once, disseminated through digital media and the institutional network (UNISA). Participation was voluntary, with an electronic Free and Informed Consent Form. The analysis was performed descriptively, using Microsoft Excel® software for calculating means and percentages.

RESULTS

55 Medical students participated: 81.8% women, 18.2% men. Regarding the clinical knowledge of the disease, the respondents pointed out the following as the main symptoms of the febrile phase: high fever (89.1%), headache/retro-orbital pain (90.9%), myalgia/arthralgia (78.2%), petechiae (52.7%), runny nose/sneezing (20%), conjunctival hyperemia (12.7%), and jaundice (7.3%). Regarding the critical phase, they pointed out: mucosal bleeding (83.6%), gastrointestinal/urinary bleeding (41.8%), hypotension (58.2%), biphasic fever (58.2%), severe abdominal pain (54.5%), and neurological changes (36.4%). Regarding the risk factor for hemorrhagic dengue, 85.5% indicated secondary infection with a different serotype, 10.9% advanced age, 3.6% recent vaccination, and none cited intense physical activity. As the main management, 92.7% of participants indicated rehydration/symptomatic support, 7.3% antivirals/support, and no one selected corticosteroids or oral antibiotics/support. The findings indicate good mastery of classic aspects (febrile symptomatology, notification, management), but point to specific gaps (e.g., ascites as an alarm sign: 25.5%; misunderstandings about analgesics: 10.9% avoided dipyrone/paracetamol; 16.4% attributed prevention to supplements), in addition to low practical self-confidence for patient care, suggesting the need for curricular emphasis on clinical scenarios and active methodologies.

CONCLUSION

UNISA students demonstrate good theoretical knowledge about dengue, but with critical points to strengthen. The combination of knowledge results, self-confidence, and student demand for more content (96.4%) supports the expansion of educational strategies with a practical focus and continuous updating, aiming for greater safety in management and better performance in surveillance, notification, and health education.

KEYWORDS

Dengue; Students; Infectious Diseases; Medicine.

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INTRODUCTION

Dengue is an arbovirosis transmitted to humans by the female Aedes mosquito, with Aedes aegypti being the main vector in the Americas. The Dengue Virus (DENV) belongs to the Flavivirus genus, of the Flaviridae family. There are four different serotypes of this virus (DENV 1-4), which vary according to the structure of their proteins and present a wide clinical spectrum.[1,2] Serotype DENV1 stands out for its greater virulence, given its capacity to cause large epidemics in a short period of time.[3] The cycle of the disease begins through the bite of an infected mosquito on susceptible individuals, allowing this vector to transmit the disease to healthy people after an incubation period of 8 to 12 days in the insect. Aedes aegypti deposits its eggs in containers of stagnant water in environments near residences, where they hatch and the larvae develop.[2]

The first case of dengue described in Brazil was in 1645, in the city of Recife. Seven years after this report, the first epidemic of the disease occurred in the country, causing more than 2000 deaths in Salvador. In 1950, Aedes aegypti was eradicated in Brazil, but it returned in 1980 and remains present to this day. Dengue epidemics in Brazil have shown a cyclical pattern, with intense epidemic peaks interspersed with inter-epidemic peaks of 3 to 4 years, a period that has been decreasing over the years. The incidence of the disease is higher during rainy periods, and seasonal outbreaks of the illness are capable of bringing a great overload to the Unified Health System (SUS), especially when associated with peaks of other diseases, as observed in 2020 with Covid-19.[4]

Cases of the disease in the country are subject to mandatory notification by SINAN (Information System for Notifiable Diseases).[4] Between 2014 and 2019, more than 5.8 million cases of dengue were notified in Brazil, showing a large increase due to the extensive rainy period and the introduction of the DENV-2 serotype, which hardly circulated in the country before 2018.5 Since then, in 2023 and 2024, there has been a significant increase in cases of the disease compared to previous years. In 2023, approximately 1.5 million new dengue cases were reported, and 4.3 million in 2024 up to May, compared to approximately 900 thousand cases in 2020 (associated with the Covid-19 pandemic) and 500 thousand in 2021. Thus, bearing in mind the epidemic experienced in the current scenario of 2024, it is essential that Medical course students are prepared to attend to patients with suspected cases in the various stages, as well as to disseminate relevant information about the clinical picture and prevention of the disease to the population.[6]

In this regard, some points about symptomatology, clinical management, and prevention must be highlighted. The incubation period of dengue in humans is 3 to 15 days (average 4 to 7 days), and the clinical picture is variable, ranging from asymptomatic cases to fatal hemorrhagic disease. After this interval, symptoms begin abruptly, usually with fever and non-specific symptoms.[7] The clinical course of the disease follows three phases: the febrile phase, the critical phase, and the recovery phase. The febrile phase, also called classic dengue, lasts 3 to 7 days and is characterized by high fever, myalgia, arthralgia, headache, retro-orbital pain, and anorexia. It may present with respiratory, gastrointestinal manifestations, mild and painful hepatomegaly, facial and lip flushing, and maculopapular rash. Starting from the second day, laboratory tests already show alterations such as leukopenia, thrombocytopenia, and slight elevation of liver enzymes. At the end of this phase, hemorrhagic manifestations such as petechiae, purpuras, and ecchymoses may be present.[8]

A portion of affected patients will progress to the critical phase of the disease (formerly called dengue hemorrhagic fever), which lasts 24 to 48 hours and usually begins with the decline of the febrile episode. Warning signs of severe dengue, when present, emerge in this phase of the disease, and result from systemic vascular leakage, which can lead to bleeding, severe hypovolemic shock, and multiple organ dysfunction. These warning signs include intense and continuous abdominal pain, persistent vomiting, fluid accumulation (ascites, pleural effusion, and pericardial effusion), postural hypotension or presyncope, hepatomegaly ≥2 cm below the costal margin, mucosal bleeding, and lethargy or irritability. The main pathophysiological characteristic of this phase is hemoconcentration, which is evidenced by a 20% increase in the hematocrit value from the baseline (the greater the increase, the greater the severity of the disease).[1,2,9]

Finally, in the recovery phase, there is a cessation of vascular leakage, and the leaked fluid begins to be reabsorbed, leading to a marked clinical improvement in the patient.[9]

In this context, primary dengue infection occurs through an individual's first exposure to any serotype of the disease, which may or may not cause symptoms. This infection confers immunity against the specific acquired serotype, resulting in a positive IgG titer for life. On the other hand, secondary infection by a different serotype, after previous exposure to another serotype, is the most concerning scenario. This occurs because the antibodies produced in the first exposure are non-neutralizing against the second acquired serotype, being incapable of efficiently fighting the virus.[2] Furthermore, these antibodies can facilitate the entry of the virus into monocytes via Fc receptors, where they will replicate, causing a higher viral load and worsening the condition.[1]

After clinical suspicion, dengue can be confirmed through laboratory tests that detect viral antigens or antibodies in the blood. During the beginning of the febrile phase, antigen detection tests are preferable due to their high sensitivity, with the NS1 protein identification test being the most commonly performed in the SUS. Starting from the 5th day of illness, ELISA-based serology can be performed, detecting IgG and IgM antibodies.[1]

Thus, given the various presentations of dengue, the World Health Organization (WHO) divides patients into four classes for disease management. Group A covers patients with no warning signs, comorbidities, risk factors, or special clinical conditions, who can be treated at home with oral hydration and paracetamol or dipyrone (avoiding non-steroidal anti-inflammatory drugs, NSAIDs), always being instructed about possible signs of disease severity. Group B patients are individuals without warning signs for the disease but who may present some type of spontaneous or tourniquet-test-induced bleeding and/or comorbidities. This group requires ordering complementary exams and a complete blood count, in addition to in-hospital oral or intravenous hydration (if oral hydration is not tolerated). Based on this, we evaluate the hematocrit, and, if altered or if warning signs appear, we must treat according to the guidelines for Group C. If the hematocrit values are normal, treatment and hydration will be carried out on an outpatient basis, with daily re-evaluation.[10] Group C encompasses patients with warning signs of the disease, requiring immediate fluid replacement with saline solution (NS) at 10 ml/kg, in addition to patient hospitalization until the condition stabilizes, monitoring of clinical and laboratory parameters, glycemic control, and treatment of hemorrhagic manifestations. Finally, Group D involves patients with signs of shock, severe bleeding, or target organ dysfunction. Patients in this group must be immediately transferred to an intensive care unit bed, with continuous monitoring and rigorous fluid replacement.[9]

The main form of dengue prevention in Brazil is based on attempts to control the Aedes aegypti mosquito. Health agents are essential figures in these actions and have the role of combating vector breeding sites; however, in recent years there has been a decline in the hiring and activity of these professionals, leaving the population with less access to this service.[5] Therefore, public awareness regarding actions to minimize the replication of this mosquito is extremely important, the main one being the fight against the accumulation of stagnant water.[5]

On the other hand, the prospects for dengue control in Brazil are not promising. The number of cases of the disease is related to factors highly present in the country, such as deforestation, precarious sanitation, and climate change.[4] Furthermore, the modern urban society lifestyle highly favors the proliferation of Aedes aegypti. This occurs due to several aspects, such as inadequate waste disposal, where objects like tires, packaging, and disposable bottles are dumped in vacant lots and end up serving as new breeding sites for the mosquito. We must also highlight the issue of growing urban violence, which makes communities resistant to the visits of health agents to their homes to assist in eliminating breeding sites.[5]

Finally, in addition to actions to combat the Aedes aegypti mosquito, there is also dengue prevention through vaccination. In 2015, the Brazilian Health Regulatory Agency (ANVISA) approved the Dengvaxia® vaccine for disease prevention, which covers all four dengue serotypes. Despite this, this vaccine was suspended in Brazil in 2017 due to the increased risk of severe disease in individuals who had never been exposed to DENV.[4] Already in December 2023, given the critical scenario of cases, hospitalizations, and deaths from dengue, the Ministry of Health incorporated the Qdenga® vaccine, from the Japanese laboratory Takeda, into the National Immunization Calendar, initially intended for children and adolescents aged 10 to 14 years, an age group with the highest rate of hospitalizations due to the disease, after the elderly.[11] Thus, the present study aimed to understand the level of knowledge of Medical students at Universidade Santo Amaro regarding the clinical picture, diagnosis, management, and prevention of the illness.

METHODS

A descriptive study involving the collection of primary data, carried out through a structured questionnaire, with closed, multiple-choice questions, which was completed online by the participants, who were individuals over 18 years of age.

The questionnaire was made available to participants via digital media, through the Google Forms Platform, administered only once, with a direct link to the questions, which remained hosted on the Google Docs platform. Completion was done online by the participants.

Dissemination was carried out in social media groups and through a network of professionals and students linked to the educational institution (students, professors, managers).

Participation in the research was voluntary and optional, subject to the participant's free and informed consent. The electronic version of the questionnaires included a Free and Informed Consent Form, so participants only gained access to the questionnaire if they agreed to it.

The analysis was performed descriptively, using Microsoft Excel® software for calculating means and percentages. This work was authorized by the Ethics and Research Committee of Universidade Santo Amaro and registered on Plataforma Brasil, under opinion number 7.235.444.

RESULTS

Fifty-five medical students from Universidade Santo Amaro participated in this research, all of whom read and agreed to the Free and Informed Consent Form.

Regarding the personal profile of the participants, 45 students (81.8%) were female and 10 (18.2%) were male. Of these, 36 students (65.5%) were between 18 and 23 years old, 14 were between 24 and 29 years old (25.5%), 1 was between 30 and 34 years old, 2 were between 35 and 40 years old, and 2 were over 41 years old.

At the time of completing the survey, 30 participants (54.5%) were attending the 8th semester, 17 participants were in the 7th semester (29.1%), 4 participants (7.3%) were in the internship (9th, 10th, 11th, and 12th semesters), 1 in the 5th semester, 1 in the 4th semester, 2 in the 3rd semester, and 1 in the 2nd semester.

Twenty-eight (28) of the participating students live with family (50.9%), 16 live alone (29.1%), 8 with spouses (14.5%), and 2 in a student residence with other people (1 with another person).

Twenty-five (25) of these students (45.5%) have parents, siblings, or grandparents who are healthcare professionals in the family, 10 have other relatives (18.2%) who are healthcare professionals, and 20 (36.4%) do not have healthcare professionals in the family.

When questioned about the areas of Medicine in which each student is most interested, where more than one answer could be selected, 3 students were interested in Family and Community Medicine, 6 in Infectology, 5 in Intensive Care Medicine, 14 in Pediatrics, 14 in Gynecology and Obstetrics, 22 in Internal Medicine (excluding the areas of Infectology and Hematology), 20 in General Surgery, 3 in Dermatology, 1 in Orthopedics and Traumatology, 2 in Ophthalmology, 1 in Geriatrics, 2 in Psychiatry, and none in Hematology.

Among the interviewed students, 8 (14.5%) participants had already been diagnosed with dengue, with 3 presenting severe manifestations of the disease. Nevertheless, 39 of the respondents (70.9%) had a family member or close friend diagnosed with dengue, with 9 of these acquaintances (21.4%) presenting some severe manifestation of the disease.

In the section on theoretical knowledge, the first question was: which symptoms are found in the symptomatology of classic dengue (febrile phase), where more than one answer could be selected. In this question, 49 students (89.1%) indicated high fever as one of the symptoms, 7 (12.7%) selected conjunctival hyperemia, 4 (7.3%) jaundice, 50 (90.9%) headache and retro-orbital pain, 29 (52.7%) petechiae, 11 (20%) coryza and sneezing, and 43 (78.2%) myalgia and arthralgia.

The second question asked which symptoms are commonly found in the symptomatology of the critical phase of dengue (formerly called hemorrhagic dengue), where more than one answer could be selected. In this question, 46 students (83.6%) marked mucosal bleeding as one of the symptoms, 23 (41.8%) marked gastrointestinal or urinary tract bleeding, 32 (58.2%) marked hypotension, 32 (58.2%) marked biphasic fever, 30 (54.5%) marked intense abdominal pain, and 20 (36.4%) marked neurological alterations.

The third question contested which symptoms are considered warning signs of dengue that may indicate progression to a shock state, where more than one answer could be selected. In this question, 14 students (25.5%) selected ascites as a sign, 30 (54.5%) selected persistent vomiting, 28 (50.9%) selected hepatomegaly, 25 (45.5%) selected lethargy, 51 (92.7%) selected thrombocytopenia, and 23 (41.8%) selected postural hypotension.

The fourth question asked which factor can increase the risk of progression to hemorrhagic dengue, where only one answer should be selected: 6 students (10.9%) marked advanced age, 47 (85.5%) marked secondary infection by a different serotype, 2 (3.6%) marked recent vaccination against other diseases, and no student selected intense physical activity.

The fifth question asked which medication should be avoided in a suspected case of dengue: 3 students (5.5%) answered that dipyrone should be avoided, 47 (85.5%) answered acetylsalicylic acid, 4 (7.3%) answered paracetamol, and 1 (1.8%) student answered metoclopramide. The fifth question also asked what the main approach to treating a patient with dengue is, where only one answer should be selected. In this question, 51 participants (92.7%) answered that rehydration and symptomatic support would be the main approach, 4 (7.3%) answered antivirals and symptomatic support, and no participant selected the other alternatives (corticosteroids or oral antibiotics and symptomatic support).

The sixth question asked how the notification of dengue cases to health authorities is done, in which 45 students (81.8%) selected that all suspected cases must be notified, 8 (14.5%) students selected that only cases confirmed by laboratory should be notified, 2 students (3.6%) selected that only suspected cases in endemic areas should be notified, and no student selected the answer that only severe cases should be notified.

The seventh and final question in this section asked which measures are important for dengue prevention, where more than one answer could be selected. Forty-nine (49) students (89.1%) selected that education on the use of repellents is important for disease prevention, 55 (100%) of the students selected elimination of stagnant water to combat mosquito breeding sites, 9 (16.4%) of the students selected taking vitamin supplements to strengthen the immune system, and 31 (56.4%) of the students selected vaccination campaigns.

In the last section, regarding confidence in the topic, it was asked if the interviewed students feel confident in managing a patient with suspected dengue, in which 21 students (38.2%) feel confident, 6 (10.9%) do not feel confident, and 28 (50.9%) are unsure. It was also contested whether these students feel confident in passing on truthful information about dengue to family and friends, in which 39 of the respondents (70.9%) feel confident, 4 (7.3%) of the respondents do not feel confident, and 12 (21.8%) are unsure. Finally, it was inquired whether the students believe that, since we are experiencing an epidemic scenario of dengue in 2024, the disease should be more addressed in the classroom. In this question, 53 respondents (96.4%) answered yes, while 2 (3.6%) answered that they did not believe it was necessary.

DISCUSSION

The sample was predominantly composed of young women (81.8% female and 65.5% between 18 and 23 years old) from the 8th and 7th semesters (83.6%) by analyzing the profile of the participants who answered the questionnaire. These factors may have positively influenced the students' theoretical performance, as they are close to the internship phase, having greater clinical contact with patients. However, the sample is not very representative of the initial semesters (only 5 students from the first 5 semesters), which limits the generalization of the data to the entire medical course. Half of the respondents live with healthcare professionals in the family, which may suggest greater familiarity with clinical topics, in addition to favoring the discussion of information regarding epidemics and preventive measures at home.

On the other hand, an American study demonstrated that this factor may also be associated with a lower propensity to work in primary care or among vulnerable populations.[12] In this sense, only 6 students are interested in Infectology and 3 in Family and Community Medicine, which may also reflect a lower valuation of areas focused on public health, which is concerning in a country with a large burden of endemic diseases like dengue.

Regarding theoretical knowledge about dengue, the data show good rates of correct answers to the questions. 90.9% of participants recognized headache and retro-orbital pain as common symptoms in the febrile phase of the disease, 83.6% recognized mucosal bleeding as a symptom of the critical phase, 92.7% indicated thrombocytopenia as a warning sign of the disease, 92.7% marked rehydration/symptomatic support as the chosen conduct, and 81.8% know that all suspected cases must be reported.

These data show that the students understand the main aspects of dengue well, which is encouraging given the current epidemic scenario of 2024. This may reflect adequate minimum curricular coverage, in addition to the broad media exposure on the topic during epidemics.

On the other hand, despite the good overall performance, some points of confusion were identified. Only 25.5% recognized ascites as a warning sign of the disease, even though this is a relevant finding in the critical phase of the illness. Furthermore, 10.9% believe that the use of dipyrone or paracetamol should be avoided during the disease, which could directly affect clinical management and symptomatic treatment of patients. Moreover, 16.4% of participants believe that vitamin supplements help in prevention, which is a belief not based on scientific evidence.

These data reveal that, even among students in advanced stages of the course, there are gaps in topics that require rigorous clinical differentiation, which can hinder the early recognition of severe forms of the disease and the symptomatic treatment of this condition. In this context, it is essential to have more clinical approaches based on real scenarios or simulations during the curriculum, so that students encounter important details regarding diseases in outbreak settings, which are often not perceived only in theory. Simulation-Based Medical Education (SBME) emerged based on the assumption that medical learning will be improved in a context that closely reflects the clinical setting, being used to replace or enhance the classroom model with highly simulated patients and clinical scenarios. A Chinese study evaluated the effectiveness of SBME in undergraduate student training, concluding that this model has a positive influence on student training, being more effective in acquiring clinical skills compared to traditional medical education.[13]

When analyzing student confidence regarding dengue knowledge, only 38.2% of students feel confident in managing suspected cases, while 70.9% feel capable of passing information on to the population. This suggests a dissonance between theoretical knowledge and clinical practice, possibly indicating that current teaching may not be sufficiently preparing students to act safely in real situations, despite having theoretical knowledge to do so. A study conducted in Florida with 413 physicians demonstrated that educational interventions based on structured clinical sessions, called the "Grand Rounds" model, with a "train the trainer" approach, where real cases are discussed interactively and focused on practical decision-making, was highly effective in improving professionals' clinical confidence regarding dengue. After the intervention, the average score on tests went from 74.3% to 94.2%, in addition to an increase in self-confidence to manage and recognize suspected cases.[14]

Incorporating similar methodologies into Brazilian medical undergraduate education can significantly contribute to student safety and ensure better preparation for epidemic scenarios. Furthermore, outbreaks and epidemics represent a great learning opportunity for students in facing a health crisis, in addition to the students' contribution being valuable for an overburdened health system. Establishing a clear structure for students' roles in these circumstances increases the preparation of future doctors for future challenges related to epidemics, maintaining a solid and robust education for the students.[15]

Although the study provides relevant information about student knowledge, some methodological limitations must be considered. The research was conducted at only one university, which restricts the generalization of the findings, and it is not possible to state that the analyzed sample faithfully represents the entire group of students enrolled in the assessed semesters. Insufficient solid knowledge about epidemiologically relevant diseases among Medical students can directly impact the health system's response capacity. Newly graduated physicians may represent the first point of contact with the population during outbreaks or sanitary emergencies, and therefore, their theoretical and practical preparation is decisive for early diagnosis, timely notification, and the adoption of adequate control measures. In the Brazilian context, a significant portion of physicians entering Primary Health Care (PHC) is composed of professionals in the early stages of their careers, attracted by public provision policies. The Mais Médicos Program[16,17] and PROVAB[18] offer financial and formative incentives for working in Basic Health Units, especially in areas of difficult provision. These initiatives seek to retain young physicians in the SUS and strengthen their training in Family and Community Medicine, recognizing the strategic role of this group in the initial response to outbreaks, sanitary emergencies, and public health demands. The persistence of conceptual gaps, or the maintenance of ideas based on common sense, tends to reduce the effectiveness of surveillance actions and the quality of health communication, especially in contexts of high demand, such as arbovirosis epidemics. International studies indicate that this phenomenon is not exclusive to Brazil: among Latin American medical students, more than 80% showed only intermediate knowledge about dengue, Zika, and Chikungunya, without reaching a high level of proficiency, reflecting a regional difficulty in aligning medical training with public health needs.[19]

This educational fragility highlights the importance of incorporating active methodologies and training in simulated epidemic scenarios into undergraduate education, promoting clinical and communication competencies aimed at facing sanitary emergencies.

Finally, 96.4% of respondents believe that dengue should be more addressed in the classroom, which is a strong piece of data reinforcing the need for curricular review, especially in times of epidemic. The students themselves recognize a gap in their training when facing an urgent epidemiological reality. Curricular actions can include update classes with specialists, simulated clinical cases, and interactive workshops on the topic. It is of paramount importance that the University understands the main learning styles and how to best apply them among its students. However, there is a scarcity of specific studies on the learning of medical students in Brazil and its association with academic performance. [20]

CONCLUSIONS

The data obtained in this research reveal that medical students at Universidade Santo Amaro, mostly in the final clinical semesters, demonstrate good theoretical performance regarding dengue, especially in the classic aspects of the disease, such as symptomatology of the febrile phase, therapeutic conduct, and notification criteria. However, important gaps were observed in points that require greater clinical accuracy, such as the recognition of less evident warning signs and the correct choice of symptomatic medications. This reinforces that, even in the final semesters of the course, the knowledge acquired is not always sufficient to ensure safe and adequate conduct when facing common diseases in the Brazilian context.

This limitation is also expressed in the low reported confi-

dence among students regarding the management of patients with suspected dengue. The discrepancy between good theoretical knowledge and practical insecurity suggests that current teaching still lacks active methodologies and clinical experiences focused on tackling prevalent diseases.

Furthermore, the low interest of students in areas such as Infectology and Family Medicine, coupled with the high proportion of students with relatives in the healthcare field, raises questions about the factors influencing career choices and the valuation of specialties focused on public health. In a country with a high burden of endemic diseases, this represents a challenge for training physicians committed to addressing the main collective health demands.

Finally, the students themselves believe that dengue should be more addressed in the classroom, which highlights a clear perception of the need for curricular review. Expanding space for public health topics, integrating clinical simulations, practical workshops, and interactive activities are possible paths to strengthen medical training and prepare it more effectively to deal with the country's epidemiological realities. For this, it is essential that new research be developed to investigate the best learning methods among students at Brazilian universities for diseases during outbreaks.

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