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RESEARCH

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Social support and provision of personal protective equipment for nursing professionals during COVID-19

Apoio social e garantia de equipamentos de proteção individual para profissionais de enfermagem na COVID-19

Apoyo social y provisión de equipos de protección individual para profesionales de enfermería durante la COVID-19

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Abstract

Objective: to analyze social support networks among nursing professionals to ensure access to personal protective equipment during the COVID-19 pandemic in two Brazilian municipalities. **Method:** a cross-sectional study was carried out with 163 nursing professionals from Rio de Janeiro and Fortaleza, whose data collection took place in 2020, using an online questionnaire. The data was analyzed using Social Network Analysis with Gephi software. **Results:** administrators and head nurses played central roles in social support networks, ensuring access to personal protective equipment. However, gaps were identified, including the absence of professional categories such as biologists, nutritionists, and pulmonologists, which indicates possible failures in communication or collaboration between different sectors. **Conclusion and implications for practice:** structured social support networks are essential for the protection of health professionals in crisis situations. Leadership must be strengthened and greater integration between professional categories must be promoted. Training programs and institutional policies that encourage collaboration and mutual support are essential to improve emergency response capacity and ensure the safety of healthcare professionals.

Keywords: Social Support; COVID-19; Personal Protective Equipment; Nursing Professionals; Social Networks.

Resumo

Objetivo: analisar as redes de apoio social entre profissionais de enfermagem para garantir o acesso a equipamentos de proteção individual durante a pandemia de COVID-19, em dois municípios brasileiros. **Método:** estudo transversal realizado com 163 profissionais de enfermagem do Rio de Janeiro e de Fortaleza cuja coleta de dados ocorreu no ano de 2020, por meio de um questionário on-line. Os dados foram analisados utilizando-se a Análise de Redes Sociais com o *software* Gephi. **Resultados:** administradores e enfermeiros chefes desempenharam papéis centrais nas redes de apoio social, assegurando o acesso aos equipamentos de proteção individual. No entanto, foram identificadas lacunas, como a ausência de categorias profissionais, como biólogos, nutricionistas e médicos pneumologistas, o que indica possíveis falhas na comunicação ou na colaboração entre diferentes setores. **Conclusão e implicações para a prática:** redes de apoio social estruturadas são essenciais para a proteção dos profissionais de saúde em situações de crise. As lideranças devem ser fortalecidas e uma maior integração entre categorias profissionais deve ser promovida. Programas de capacitação e políticas institucionais que incentivem a colaboração e o apoio mútuo são essenciais para melhorar a capacidade de resposta a emergências e garantir a segurança dos profissionais de saúde.

Palabras-chave: Apoio Social; COVID-19; Equipamento de Proteção Individual; Profissionais de Enfermagem; Redes Sociais.

Resumen

Objetivo: analizar las redes de apoyo social entre profesionales de enfermería para garantizar el acceso a equipos de protección personal durante la pandemia de COVID-19 en dos municipios brasileños. **Método:** estudio transversal realizado con 163 profesionales de enfermería de Río de Janeiro y Fortaleza, cuya recolección de datos tuvo lugar en 2020, mediante cuestionario online. Los datos se analizaron mediante Análisis de Redes Sociales con el software Gephi. **Resultados:** los administradores y jefes de enfermería desempeñaron papeles centrales en las redes de apoyo social, garantizando el acceso a los equipos de protección personal. Sin embargo, se identificaron vacíos, como la ausencia de categorías profesionales como biólogos, nutricionistas y neumólogos, lo que indica posibles fallas en la comunicación o colaboración entre diferentes sectores. **Conclusión e implicaciones para la práctica:** las redes estructuradas de apoyo social son esenciales para la protección de los profesionales de la salud en situaciones de crisis. Hay que reforzar el liderazgo y promover una mayor integración entre categorías profesionales. Los programas de formación y las políticas institucionales que fomentan la colaboración y el apoyo mutuo son esenciales para mejorar la capacidad de respuesta ante emergencias y garantizar la seguridad de los profesionales de la salud.

Palabras clave: Apoyo Social; COVID-19; Equipo de Protección Personal; Profesionales de Enfermería; Redes Sociales.

INTRODUCTION

Nursing teams are among the occupational groups most vulnerable to the transmission of infectious diseases, as they work intensively in direct patient care, which places their lives at risk and increases the pressure on their work process. This risk intensified during the COVID-19 pandemic, when nurses and nursing technicians became essential on the front line of dealing with the health crisis. The increased workload, shortage of supplies, and high exposure to SARS-CoV-2 have led to high rates of transmissibility and mortality among healthcare workers, with approximately 10% of global COVID-19 cases involving healthcare workers, and more than 2,000 deaths recorded among nurses in countries such as Brazil, the United States, and the United Kingdom, according to the International Council of Nurses (ICN) and the World Health Organization (WHO).[1-3]

In addition to the risks of contamination, nursing professionals faced a shortage of personal protective equipment (PPE), which aggravated exposure to the virus and intensified the challenges in implementing the required preventive measures. In Brazil, the regulations that define the set of actions and resources to protect the health and staff of professionals, including nurses, can be found in Regulatory Standard 32, which establishes safety requirements and the provision of PPE in healthcare facilities.[4] However, given the limitations imposed by the pandemic, the difficulty in distributing and accessing these supplies has affected the safety of health workers and exposed weaknesses in the occupational protection structure.[5,6]

The training of nursing professionals in Brazil takes place at two levels: high school for nursing technicians and higher education for nurses, who coordinate, manage, and supervise health services.[7,8] Historically, the category has been dominated by women, faces exhausting working hours, and has salaries that are often the subject of discussions about implementing a national salary cap.[9] These working conditions have a direct impact on the quality of care and the health of workers since, regardless of their level of training, nurses take on high levels of responsibility and workload when caring for patients.[7,8]

Different arrangements for the composition of nursing teams are used to meet health demands, especially in contexts of adversity and scarcity of resources. During the COVID-19 pandemic, these professionals had to adapt quickly to provide quality care, dealing with high demands and, in some cases, using advanced technologies to support patients, such as mechanical ventilators and vital signs monitors.[10] This crisis highlighted the importance of social support networks, understood as interactions of cooperation, trust, and mutual support between colleagues and managers, which are essential for mitigating the stress and insecurity of working in adverse conditions.[11-13]

During the pandemic, social support in nursing work was a fundamental factor in ensuring an environment of safety and mutual aid, promoting a network of solidarity capable of alleviating the scarcity of resources and providing an efficient response to health requirements.[12] Thus, faced with the difficulties imposed by the increase in COVID-19 cases and the lack of PPE, the social support network between nurses and nursing technicians emerged as a central strategy to maintain the quality of care and the protection of professionals.

In June 2020, the state of Rio de Janeiro had 185,790 nursing technicians and 55,413 nurses registered.[7] The state of Ceará, meanwhile, had 42,186 nursing technicians and 20,831 nurses.[7] Regarding suspected or confirmed cases and deaths from COVID-19, the COVID Observatory of the Federal Nursing Council of Brazil indicated, on June 23, 2020, that 3,877 cases were registered in Rio de Janeiro, with 32 deaths, and 1,352 cases in Ceará, with 11 deaths.[2,3]

In relative terms, the incidence of suspected cases of COVID-19 among nursing professionals was 160.7 per 10,000 workers in Rio de Janeiro, with a mortality rate of 13.3 per 100,000, while in Ceará these figures were 214.5 per 10,000 and 17.5 per 100,000, respectively. According to data from the Federal Nursing Council, the risk of illness and death among nursing professionals was higher in Ceará.[2,3]

Recognizing the difficulties faced in obtaining PPE during the pandemic, a study was structured in the state capitals of Ceará and Rio de Janeiro. Based on the concept of social support and using the Social Network Analysis (SNA) methodology,[14] this article aimed to analyze the social support networks among nursing professionals to ensure access to personal protective equipment during the COVID-19 pandemic in two Brazilian municipalities. The research is part of a broader study on nursing work during the pandemic and presents specific data on social support networks and their impact on protecting these workers during the 2020 health crisis.

METHOD

This was an observational, cross-sectional study using the SNA methodology,[14] based on a bidirectional perspective and centered on ego-type networks, using an online data collection platform. The study was carried out in healthcare facilities in the capital cities of Rio de Janeiro (RJ) and Fortaleza (CE). In each city, a reference unit was selected to care for health professionals diagnosed or suspected of COVID-19. Data collection took place between June 23 and August 5, 2020. In Rio de Janeiro, the study was carried out in a large outpatient clinic linked to a public university, while in Fortaleza the facility was a municipal hospital emergency department.

Participants were invited to answer an electronic questionnaire sent by email and shared by the researchers on messaging apps. The inclusion criteria were being a senior or technical nursing professional, agreeing to participate in the study, having worked in direct contact with the general population or people hospitalized with COVID-19, and having a suspected or confirmed diagnosis of work-related COVID-19. The participants, made up of nurses and nursing technicians, indicated other professionals or positions in their daily work that were important in facilitating or providing access to PPE.

The network formed originated from referrals from each individual, which is why it is called an egocentric or ego-type

network. The participants did not know each other and came from different services. They indicated which professionals, according to their occupation or position, stood out to ensure the provision of PPE in the care of suspected or confirmed cases of COVID-19. For the analysis, we opted for a two-way network, considering that the group of participants and the professional figures mentioned did not necessarily share the same universe of daily relationships.[15]

In the SNA methodology, this type of network has structural equivalence: nursing professionals are structurally equivalent because they connect with the same set of professional categories in health services. The two-way network analysis generated centrality measures, with the most central actors being those most frequently mentioned or highlighted by each participant.[16]

The sample included 163 nursing professionals, 99 from Rio de Janeiro (56 nursing technicians and 43 nurses) and 64 from Fortaleza (12 nursing technicians and 52 nurses). The sample size was not defined in advance, and data collection followed a time criterion, ending at the beginning of August.

The data collection instrument was a structured online questionnaire, made available by Google Forms, containing sociodemographic questions, questions about training, and a question focused on the social support network and access to PPE. The main question asked to nurses and technicians was: "Which professional category(ies) stood out the most in ensuring the provision of PPE in the care of people with a suspected or confirmed diagnosis of COVID-19?" The questionnaire was sent by email and shared in messaging groups. The questionnaire did not undergo prior validation testing, but was reviewed by six nurses working in the services to ensure the clarity of the questions.

The answers were obtained after filling in an informed consent form attached to the questionnaire. The data was stored in a Microsoft Excel© database file and then exported to Gephi© software to construct sociograms and calculate metrics. These analysis techniques consist of steps to organize the networks and actors, to identify the central positions and importance of the different participants in the network.[17]

Participants selected up to five professional categories from a list that included positions and functions in the context of COVID-19: manager, head nurse, team nurse, nursing aide or technician, general practitioner, infectious disease physician, pulmonologist, physician of another specialty, management assistant or technician, multiprofessional training team, warehouse team, pharmacist, social worker, physical therapist, nutritionist, biologist, community health agent (CHA), driver and municipal or state manager.

The data matrices generated were analyzed using Gephi© software, allowing centrality measures to be obtained and sociograms to be constructed. Sociograms were organized according to the professional categories in each municipality (nurses and nursing technicians), generating four sociograms and tables of degree centrality, proximity, and intermediation.[18] The analysis stages were based on SNA concepts such as degree centrality, proximity centrality, and intermediation centrality.[19-21]

Degree centrality indicates the number of connections each participant has in the network. In this case, it represents the number of times each category was mentioned by the nursing professionals, indicating which categories were most relevant in supporting access to PPE.[19] Proximity centrality: measures the distance between a participant and the others in the network. In bipartite networks, the minimum distance between two participants from the same set is 2, while the minimum distance between participants from different sets is 1. Proximity reflects the speed of access to support.[20] Intermediation centrality: demonstrates the ability of participants to act as intermediaries for information and actions in the network, helping to coordinate resources and information on PPE between different actors.[21]

Regarding ethical aspects, both institutions agreed to participate in the study and mobilized their professionals to invite participants. The research followed the guidelines of Resolution 466 of 2012 of the National Health Council[22] and was approved by the Human Research Ethics Committee of the State University of Rio de Janeiro, under number 4.094.637.

RESULTS

The Gephi© software generated four sociograms, which were organized according to the categories of nurses and nursing technicians in the municipalities studied (Figures 1, 2, 3, and 4). In the sociograms, the interviewees (actors) are represented by codes that typify their profession and the professionals or positions cited as relevant to ensuring access to PPE in the context of the COVID-19 pandemic are described by name. It should also be noted that the size of the node in the sociogram figures is proportional to the degree of centrality that each actor mentioned has in the social network.

The social networks show a hierarchy that dictates work processes. In the nurses' networks in Rio de Janeiro and Fortaleza, managers are the most frequently mentioned (Figures 1 and 2); in the nursing technicians' network in Rio de Janeiro, head nurses and team nurses (Figure 3); while in the nursing technicians' network in Fortaleza, those who stand out are managers and state or municipal managers (Figure 4).

However, although managers emerge in most networks as important figures in ensuring PPE (Figures 1, 2, and 4), we can see that the degree of centrality of head nurses and team nurses highlights the role of these professionals in health institutions, who, in addition to providing direct care to patients, are primarily responsible for delivering and forecasting the inputs and materials needed for health care. Tables 1 and 2 show the distribution ranking of the centrality measures of the social networks of nurses and nursing technicians in the two municipalities studied.

Tables 1 and 2 show that, from the perspective of nurses in Rio de Janeiro, managers, head nurses, and team nurses are the professionals most often recognized for ensuring that PPE is provided. In the view of nurses in Fortaleza, Ceará, these three categories are identified, in addition to state or municipal managers. The nursing technicians in Rio de Janeiro mentioned most of the professional categories as being responsible for ensuring

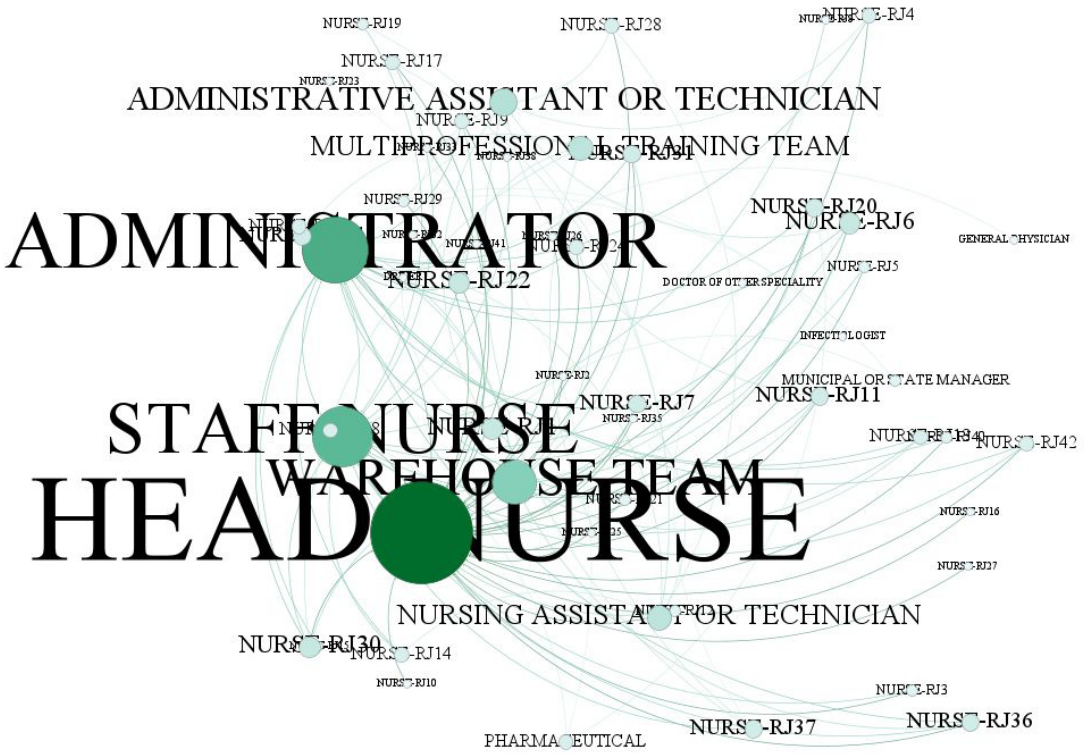

Figure 1. Sociogram of nurses in the city of Rio de Janeiro.

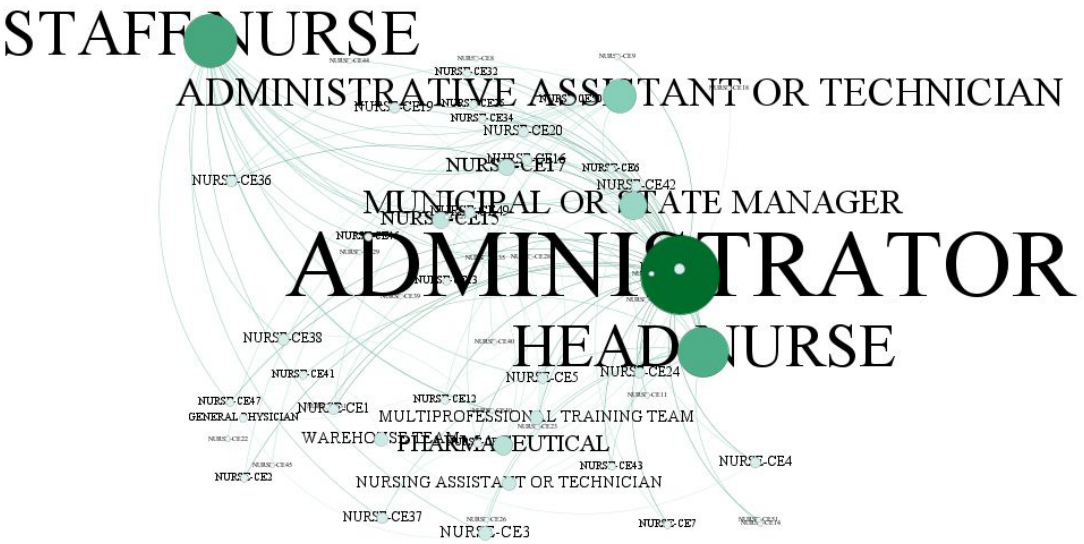

Figure 2. Sociogram of nurses in the city of Fortaleza, Ceará.

that PPE is provided: head nurses, team nurses, nursing aides or technicians, managers, warehouse teams, multiprofessional training teams, and management assistants or technicians. On the other hand, the nursing technicians in Fortaleza, Ceará, highlight managers, municipal or state managers, nursing aides or technicians, and management assistants or technicians.

In terms of degree centrality, managers, head nurses, and team nurses in the social networks of nurses in both municipalities are those with the highest degree centrality, thus having the highest number of connections (Table 1). Meanwhile, the degree of centrality in the networks of nursing technicians varies according to municipality. In Rio de Janeiro, head nurses, team nurses, and nursing aides or technicians stand out. In contrast, in Fortaleza, Ceará, managers, state or municipal managers, nursing aides or technicians, and management assistants or technicians stand out (Table 2).

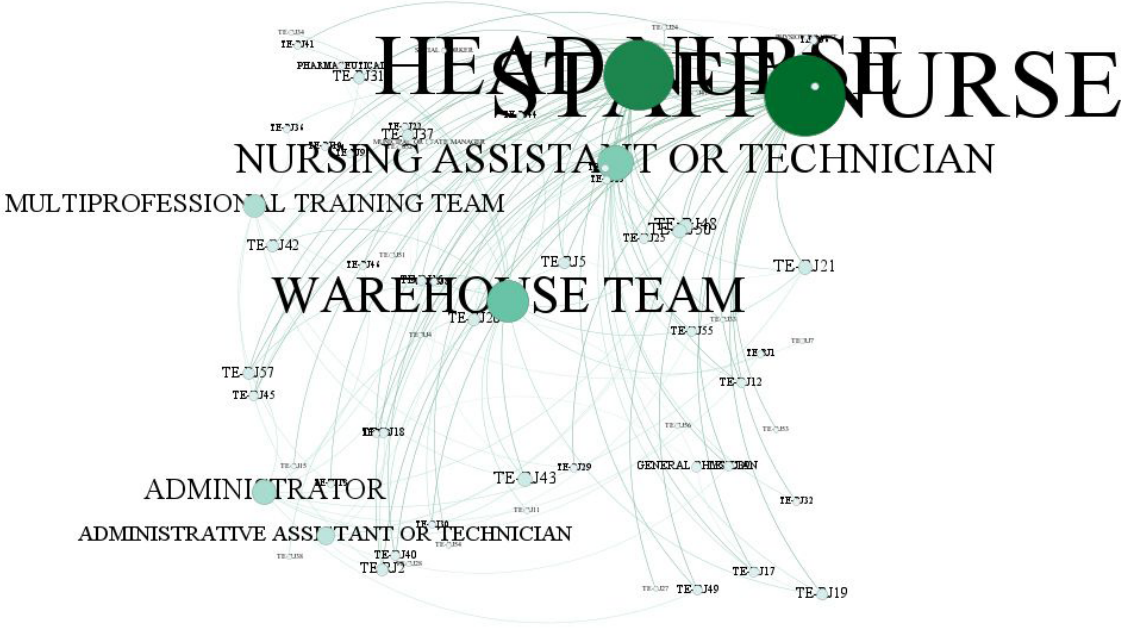

Figure 3. Sociogram of nursing technicians in the city of Rio de Janeiro.

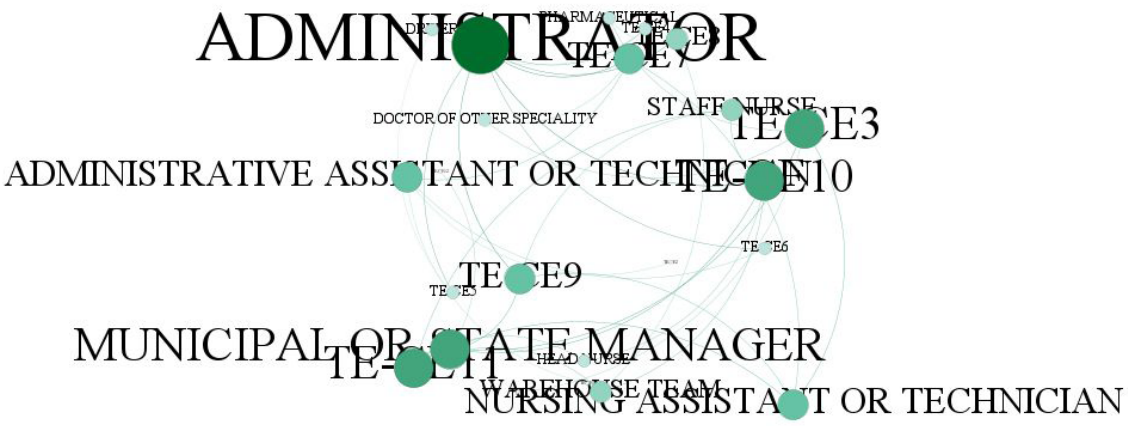

Figure 4. Sociogram of nursing technicians in the city of Fortaleza, Ceará.

The results for the proximity measure show convergence between the networks of nurses and nursing technicians in the two municipalities. In the nurses' network in Rio de Janeiro, managers and head nurses are the closest to the other actors in the network. In Fortaleza, Ceará, the closest actors are managers and team nurses (Table 1).

In the network of nursing technicians, in Rio de Janeiro, those with the greatest centrality of proximity are head nurses and team nurses, and in Fortaleza, Ceará, managers and nursing aides or technicians (Table 2).

Regarding the centrality of intermediation, in the nurses' networks in Rio de Janeiro, managers and head nurses stand out, while in Fortaleza, managers and team nurses stand out (Table 1). In the networks of nursing technicians, those with the greatest ability to mediate information and actions are, in the Rio de Janeiro network, head nurses and team nurses, and in the Fortaleza network, managers and management assistants or technicians (Table 2).

The responses from nurses and nursing technicians in the two municipalities lead us to think about the role that managers, head nurses, team nurses, nursing aides or technicians, and management assistants or technicians played in ensuring the provision of PPE in the context of COVID-19.

However, it is worth noting that certain categories, such as biologists, nutritionists, and pulmonologists, were not mentioned at all, indicating, from the survey participants' perception, possibilities such as a lack of communication or a non-relevant role in providing support to ensure the necessary inputs for protection.

Table 1. Measures of centrality of the social network of nurses from Rio de Janeiro and Fortaleza, Ceará.

Actor	Rio de Janeiro			Fortaleza, Ceará		
	Degree	Proximity	Intermediation	Degree	Proximity	Intermediation
Manager	0.452	0.672	0.179	0.519	0.721	0.384
Head nurse	0.714	0.796	0.401	0.327	0.587	0.172
Staff nurse	0.405	0.609	0.153	0.365	0.647	0.244
Nursing aide or technician	0.143	0.520	0.016	0.077	0.468	0.007
General practitioner	0.024	0.453	0.000	0.038	0.386	0.000
Infectious disease physician	0.024	0.355	0.000	0.000	0.000	0.000
Pulmonologist	0.000	0.000	0.000	0.000	0.000	0.000
Physician of another specialty	0.024	0.382	0.000	0.000	0.000	0.000
Management aide or technician	0.167	0.542	0.054	0.212	0.494	0.111
Multiprofessional training team	0.143	0.542	0.035	0.077	0.478	0.006
Warehouse team	0.286	0.600	0.085	0.077	0.473	0.030
Pharmacist	0.071	0.448	0.031	0.115	0.478	0.032
Social worker	0.000	0.000	0.000	0.000	0.000	0.000
Physical therapist	0.000	0.000	0.000	0.000	0.000	0.000
Nutritionist	0.000	0.000	0.000	0.000	0.000	0.000
CHA	0.000	0.000	0.000	0.000	0.000	0.000
Driver	0.024	0.394	0.000	0.000	0.000	0.000
State or municipal manager	0.048	0.411	0.002	0.173	0.537	0.065
Biologist	0.000	0.000	0.000	0.000	0.000	0.000

Table 2. Measures of centrality of the social network of nursing technicians in Rio de Janeiro and Fortaleza, Ceará.

Actor	Rio de Janeiro			Fortaleza, Ceará		
	Degree	Proximity	Intermediation	Degree	Proximity	Intermediation
Manager	0.179	0.523	0.049	0.583	1.091	0.249
Head nurse	0.554	0.687	0.279	0.167	0.727	0.002
Staff nurse	0.643	0.767	0.367	0.250	0.750	0.007
Nursing aide or technician	0.268	0.561	0.058	0.333	0.960	0.074
General practitioner	0.054	0.426	0.001	0.000	0.000	0.000
Infectious disease physician	0.000	0.000	0.000	0.000	0.000	0.000
Pulmonologist	0.000	0.000	0.000	0.000	0.000	0.000
Physician of another specialty	0.000	0.000	0.000	0.167	0.800	0.019
Management aide or technician	0.125	0.495	0.032	0.333	0.750	0.104
Multiprofessional training team	0.161	0.505	0.045	0.000	0.000	0.000
Warehouse team	0.321	0.597	0.144	0.250	0.774	0.016
Pharmacist	0.036	0.438	0.000	0.167	0.750	0.013
Social worker	0.018	0.442	0.000	0.000	0.000	0.000
Physical therapist	0.018	0.411	0.000	0.000	0.000	0.000
Nutritionist	0.000	0.000	0.000	0.000	0.000	0.000
CHA	0.000	0.000	0.000	0.083	0.615	0.000
Driver	0.000	0.000	0.000	0.167	0.585	0.001
State or municipal manager	0.018	0.414	0.000	0.417	0.889	0.093
Biologist	0.000	0.000	0.000	0.000	0.000	0.000

DISCUSSION

Studies on the analysis of social networks in health are essential for identifying the individuals who hold the information, inputs, and strategies for maintaining the network, as well as helping to reveal the poorly connected actors who tend to affect production or communication negatively.[15,18] Based on the findings of the sociogram analysis, it is possible to think of new processes and flows that dialog with the social characteristics highlighted.[21] However, social network analysis is still underused to support interventions aimed at health teams.[23,24]

In the context of this study, the results indicate that the social support offered to nurses and nursing technicians by the social networks created during the COVID-19 pandemic was relevant to ensuring provision of PPE. Centrality metrics such as degree centrality, proximity centrality, and intermediation centrality highlight the importance of central actors in mediating information and coordinating efforts to ensure access to PPE.[16,25,26]

Managers and head nurses emerged as the central actors in the social support networks in the municipalities of Rio de Janeiro and Fortaleza. These professionals played a crucial role in mediating information and coordinating efforts to ensure the availability of PPE. In both municipalities, these actors showed a high degree of centrality, proximity centrality, and intermediation centrality, indicating their ability to influence and facilitate communication and logistics within the network.

Degree centrality measures the number of direct connections an actor has within the network. In this study, managers and head nurses had high degrees of centrality, reflecting their role as the main contact for several other team members. This high degree of centrality makes these actors key to rapidly disseminating information and coordinating the crisis response.[18,26]

Proximity centrality assesses the distance between an actor and all the others in the network, measuring the efficiency with which an actor can reach other members. Managers and head nurses in the networks are in a strategic position, with high proximity centrality, which contributes to more effective communication and quick access to relevant information, such as the location and distribution of PPE.[16,27]

The centrality of intermediation indicates the frequency with which an actor serves as an intermediary in communication between other members of the network. High intermediation values for managers and head nurses highlight their importance in mediating interactions and solving logistic and operational problems within the network.[21,25]

The study results align with the existing literature, which points to social support as an essential factor in the work process, organization, and response of health teams in the face of crises. Relationships of trust and mutual help strengthen group cohesion, allowing for a more coordinated and effective response to the demands imposed by the pandemic.[28,29] The SNA revealed that nurses and nursing technicians formed robust support networks, in which central actors facilitated the flow of information and resources, mitigating PPE shortages and promoting the well-being of healthcare workers.[30,31]

When comparing the social networks of health professionals in the municipalities of Rio de Janeiro and Fortaleza, there is a similarity in the structure of the networks, with managers and head nurses standing out in both contexts. This consistency suggests that certain professional roles are universally important for ensuring social support networks in health care, regardless of regional differences. Recent studies reinforce that the centrality of certain actors is essential for the cohesion and functionality of networks, even in diverse contexts.[23,32]

In the health context, studies have emphasized the importance of the flexibility and adaptability of social support networks in times of crisis, including highlighting the ability of public health workers in Brazil to adapt their practices to face the challenges imposed by COVID-19.[33] In addition, the pandemic has brought to light the relevance of digital technologies for maintaining and strengthening social support networks. Digital platforms have been used to facilitate communication and coordination between health professionals.[34]

The identification of central actors and the analysis of centrality metrics are relevant to the formulation of intervention strategies. Health institutions can use this information to strengthen links between professionals and optimize the distribution of resources and information. Thus, the study's findings reinforce how useful SNA studies can be for reflecting on work and management processes in the face of crises.[24,35]

CONCLUSION AND IMPLICATIONS FOR PRACTICE

The analysis of social support networks in the context of the work of nursing professionals during the COVID-19 pandemic clarifies the organizational dynamics and interpersonal relationships within health institutions. The identification of key actors such as managers and head nurses highlights the role of these professionals in coordinating and ensuring access to PPE essential for the safety and well-being of healthcare workers. These actors emerge as central nodes, playing intermediary and leadership roles in social networks, directly influencing the distribution and availability of the resources needed to face the pandemic.

However, the analysis also reveals significant gaps in the support network, highlighting the lack of mention of certain professional categories such as biologists, nutritionists, and pulmonologists. This omission may indicate possible failures in communication or collaboration between different sectors within health institutions, suggesting the need for a more inclusive and collaborative approach to ensure the effectiveness of protective measures.

The analysis of social networks highlights the importance of social support in the nursing working environment, especially in times of crisis such as the COVID-19 pandemic. The presence of relationships of trust, mutual help, and emotional support among co-workers not only contributes to coping with stress and

pressure, but also strengthens team cohesion and resilience in the face of challenges.

The study results highlight the need to promote a culture of support and collaboration within healthcare teams, recognizing and strengthening the bonds between the various professionals involved in patient care. An integrated and supportive approach could be a possible way of tackling the challenges posed by pandemics, helping to ensure the safety and well-being of frontline workers.

A limitation of this study is the exclusive focus on nursing professionals, excluding other health categories that have also faced significant challenges during the pandemic. In addition, data collection during the pandemic may not reflect the normal dynamics of social support in non-pandemic times. The network identified during the pandemic probably changed after the critical period, which may limit the generalizability of the results.

For nursing practice, the results highlight nurses' role as leaders and the need to promote greater integration between the different professional categories. This can be achieved through ongoing health education and institutional policies that encourage collaboration and collective work, thus improving the ability to respond to emergencies and protect health professionals.

AUTHOR'S CONTRIBUTIONS

Study design. Helena Maria Scherlowski Leal David. Tarciso Feijó da Silva.

Data acquisition. Helena Maria Scherlowski Leal David. Tarciso Feijó da Silva.

Data analysis and interpretation of results. Helena Maria Scherlowski Leal David. Tarciso Feijó da Silva. Magda Guimarães de Araújo Faria. Rogério Bittencourt de Miranda. Rafael Bezerra Duarte. Maria Rocineide Ferreira da Silva.

Writing and critical review of the manuscript. Helena Maria Scherlowski Leal David. Tarciso Feijó da Silva. Magda Guimarães de Araújo Faria. Rogério Bittencourt de Miranda. Rafael Bezerra Duarte. Maria Rocineide Ferreira da Silva.

Approval of the article's final version. Helena Maria Scherlowski Leal David. Tarciso Feijó da Silva. Magda Guimarães de Araújo Faria. Rogério Bittencourt de Miranda. Rafael Bezerra Duarte. Maria Rocineide Ferreira da Silva.

Responsibility for all aspects of the content and integrity of the published article. Helena Maria Scherlowski Leal David. Tarciso Feijó da Silva. Magda Guimarães de Araújo Faria. Rogério Bittencourt de Miranda. Rafael Bezerra Duarte. Maria Rocineide Ferreira da Silva.

DATA AVAILABILITY

The contents underlying the research text are contained in the article.

ASSOCIATED EDITOR

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SCIENTIFIC EDITOR

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