

## THE VULNERABILITY OF NURSING WORKERS TO TUBERCULOSIS IN A TEACHING HOSPITAL<sup>1</sup>

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*This study aimed to identify aspects that potentially increase the vulnerability of nursing workers to tuberculosis, through the verification of personal life, work and disease knowledge indexes. The sample is composed of 81 nursing workers involved with assistance in the night and day shifts at USP Teaching Hospital, who answered a questionnaire about life and work habits. The sample aggregated the indexes that increase vulnerability to tuberculosis: long professional experience in hospitals and work load longer than 12 hours. Data show that nursing auxiliaries and workers from the night shift in general have a higher number of vulnerability indexes.*

**DESCRIPTORS:** tuberculosis; vulnerability; nursing; education, nursing

## LA VULNERABILIDAD A LA TUBERCULOSIS EN TRABAJADORES DE ENFERMERÍA DENTRO DE UN HOSPITAL UNIVERSITARIO

*En este estudio se buscó identificar aspectos que pueden potenciar la vulnerabilidad de los trabajadores de enfermería frente a la tuberculosis, utilizando la verificación de indicadores de vida personal, trabajo y los relacionados al conocimiento de la enfermedad. La muestra estuvo conformada por 81 trabajadores de enfermería involucrados con la asistencia en los turnos diurno y nocturno del Hospital Universitario de la USP, los cuales respondieron a un cuestionario sobre los hábitos de vida y de trabajo. A través de la muestra fue posible mostrar indicadores sobre la vulnerabilidad a la tuberculosis: una larga experiencia profesional en hospital y jornada con más de 12 horas diarias. Los datos mostraron que, auxiliares de enfermería y trabajadores del turno nocturno presentan mayor número de indicadores de vulnerabilidad. Gran parte de los trabajadores mostraron conocimiento equivocado sobre la enfermedad, a pesar de brindar atención a pacientes con tuberculosis. Los resultados evidenciaron la necesidad de difundir el conocimiento apropiado sobre la tuberculosis, ya que estos trabajadores constituyen agentes para su control.*

**DESCRIPTORES:** tuberculosis; vulnerabilidad; enfermería; educación en enfermería

## A VULNERABILIDADE À TUBERCULOSE EM TRABALHADORES DE ENFERMAGEM EM UM HOSPITAL UNIVERSITÁRIO

*Este estudo buscou identificar aspectos que podem potencializar a vulnerabilidade dos trabalhadores de enfermagem relacionada à tuberculose, por meio da verificação de indicadores de vida pessoal, trabalho e relativas ao conhecimento da enfermidade. A amostra compôs 81 trabalhadores de enfermagem envolvidos com a assistência nos turnos diurno e noturno do Hospital Universitário da USP, que responderam a um questionário sobre hábitos de vida e trabalho. A amostra integrou indicadores que induzem à vulnerabilidade à tuberculose: período longo de experiência profissional em hospital e jornada maior que 12 horas diárias. Os dados evidenciaram que auxiliares de enfermagem apresentam maior número de indicadores de vulnerabilidade, assim como os trabalhadores do noturno em geral. Parcela expressiva dos trabalhadores apresentou conhecimento equivocado sobre a enfermidade, apesar de prestarem assistência a pacientes com tuberculose. Os resultados evidenciam a necessidade de se difundir conhecimento apropriado sobre a enfermidade, já que esses trabalhadores constituem agentes no controle da tuberculose.*

**DESCRIPTORES:** tuberculose, vulnerabilidade, enfermagem, educação em enfermagem

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## INTRODUCTION

**K**nown as a "social evil" at the end of the 19th century, tuberculosis still haunts different countries all over the world, making victims and causing many deaths. Approximately one third of the world population is infected with the tuberculosis bacillus and, every year, 54 million people get infected, 6.8 million develop the disease and 3 million die<sup>(1)</sup>. In Brazil, it is estimated that between 35 and 45 million of the total population are infected by *M. tuberculosis*, with about 100 thousand new cases and between 4 and 5 thousand deaths every year<sup>(1)</sup>. Almost one fifth of the cases occur in São Paulo State, where 18,975 cases were notified in 1998<sup>(1)</sup>.

The important incidence of tuberculosis in our midst, even more than a century after the discovery of the etiologic agent, demonstrates the limitation of the biological medical model's proposal, because it does not adopt strategies that attempt to actually determine the disease. A study carried out in the region of Butantã, São Paulo City, in 1997, detected that social insertion can constitute an important restrictive element of ill people's accessibility to health services as, in general, for those people who are closer to social exclusion, health care becomes secondary to the need to survive<sup>(2)</sup>.

In view of the disease's eminently social nature, initiatives to control it need to focus on specific actions, but also incorporate the change in populations' living conditions. Hence, it is important to understand the disease as a process developed in individuals who are part of a certain form of social organization and, as such, are subject to distinct risks and potentialities, depending on the specific groups they belong to. That is, in the end, the disease is due to different socioeconomic groups' peculiar production and social reproduction conditions. This leads to the production of distinct potentialities to strengthen or exhaust the human body. This relation between beneficial and destructive forces is expressed in distinct health-disease manifestations<sup>(3)</sup>.

Thus, daily work and knowledge can be fundamental in terms of people's vulnerability. The term vulnerability<sup>(4)</sup> refers to people's chance of exposure to a disease, as a product of a set of not only individual, but also collective, contextual aspects, which entail greater or lesser susceptibility to infection and illness and, inseparably, to greater or lesser availability of all kinds of resources to protect these

people against diseases. That is, vulnerability is not restricted to individual determination, but includes the individual-collective. It is also emphasized that this concept takes the form of individual vulnerability, social vulnerability and programmatic vulnerability. The first refers to the degree and quality of the information individuals have at their disposal about health problems, its elaboration and application in practice. Social vulnerability assesses the obtaining of information, access to communication media, availability of cognitive and material resources, power to participate in political decisions and institutions, that is, it is related to service structuring in the policy sphere. Programmatic vulnerability, on the other hand, is the assessment of programs to respond to disease control, besides the degree and quality of institutions' commitment, of resources, of management and program monitoring at different care levels, that is, it is related to the way service organization and health care respond to collective needs.

In view of this vulnerability model<sup>(4)</sup>, this study aimed to identify potential vulnerability indicators of tuberculosis in nursing workers, which can contribute to its prevention and control. The study is based on the observation that health workers in hospitals present a specific risk of getting tuberculosis, mainly the multiresistant forms, which has been widely documented in literature<sup>(5)</sup>.

## OBJECTIVES

To characterize the general living and work conditions of nursing professionals who work day and night shifts and to identify variables that can evidence potential vulnerability to tuberculosis.

## DESIGN AND METHOD

The study was carried out at the University Hospital (UH) of the University of São Paulo and involved nursing workers. In 2003, the hospital's nursing team consisted of 164 nurses, 111 nursing technicians and 358 nursing aids, besides 12 nursing attendants who, due to legal restrictions to exercise the nursing profession, only performed administrative functions. The study only looked at workers from the divisions directly involved in nursing care or with a considerable number of nursing workers, including

the day and night shift. Thus, participants covered nursing aids (NA), nursing technicians (NT) and nurses (NN), distributed across the Rooming-In unit (maternity), Material Center, Surgical Clinic, Medical Clinic, Pediatric unit, Adult and Child Emergency Care and Adult Intensive Therapy unit, totaling 81 workers.

The empirical study variables were related to the workers' personal characteristics; living and work conditions and vulnerability to tuberculosis, such as knowledge about the disease, how it is transmitted, people who had or have the disease, health services offering diagnostic tests and care, access to information about the disease, beliefs about it, earlier care delivery to tuberculosis carriers, as well as technical preparation for care delivery to these carriers.

Data were collected, with the participants' informed consent, between September and October 2003, through a questionnaire with closed questions that was submitted to a pretest and approved by the Research Ethics Committees at the USP University Hospital and the USP School of Nursing.

We carried out a descriptive study. The collected data were systemized in EpiInfo 6.04 software, to extract absolute and relative frequencies.

## RESULTS

### Personal characteristics of the nursing workers

The study sample mainly consisted of female workers between 31 and 42 years old (42%, n: 34). In terms of education, 27.2% had only finished basic and 34.6% secondary education.

As to professional category, 48.1% (39) were nursing aids, 29.6% (24) nurses and 16% (13) nursing technicians (other professionals did not respond). According to the staff list at the hospital's Nursing Department, at the time of data collection, nursing aids corresponded to 50.5% of the Department's total staff, against 17.3% technicians and 24% nurses. Hence, the study sample corresponded to the structure of the nursing workforce in Brazil.

With respect to the shift distribution of the professionals who answered the questionnaire, 53.1% (43) worked during the day and the remainder at night. The day shift is subdivided in two six-hour periods (morning and afternoon). The night shift, on the other hand, covers 12 consecutive work hours, followed by 36 hours of rest. It should be reminded

that night work can be considered a factor of destruction, of vulnerability, to the extent that it demands greater mental effort to maintain the same performance level as in activities performed during other shifts<sup>(6)</sup>.

What the duration of their professional exercise is concerned, most participants (80.3%, n: 65) had been working for more than 2 years. A considerable number of workers (21%, n: 17) had been active for more than 10 years, 6 of whom worked in general patient care, which includes care delivery to tuberculosis carriers. This reveals yet another potential vulnerability factor.

### Their living conditions

About 44.4% (36) shared responsibility for their household with another person, which seems to be a positive aspect in terms of vulnerability. However, 34.6% (28) of participants who did not live alone were solely responsible for household expenses, due to their partner's unemployment or another non-informed reason. Although this is not a majority, they represent an important part of the total group. This aspect can represent an important vulnerability aspect.

The interviewees' monthly family income was quite heterogeneous, with the highest salaries among nurses working night shifts and the lowest among nursing aids working day shifts. A majority (27.1%) received between 6 and 8 minimum wages, which exceeds the Brazilian population's mean monthly income of approximately 1.3 minimum wages<sup>(7)</sup>. Another important piece of information is that most workers belonged to small families of up to 4 people (72.9%).

What health access is concerned, 67.9% (55) mentioned using public health services. This was most frequently indicated by nursing aids.

About 42% (34) informed that they neither practiced any sports, dance or music, nor participated in any group activity related to school, church or work. All participants mentioned they had time and access to leisure.

With respect to information access, a large majority (87.7%, n: 71) indicated that they watched television, and a majority preferred watching the news (45.7%). No expressive difference was observed in terms of work shift, as both day (48.6%, n: 18) and night shift workers (51.3%, n: 19) used television to watch the news.

Reading newspapers was another source of information for the study sample. Only 13.6% indicated not reading newspapers, 58.3% (7) of whom were nursing aids. In the group who had this habit, 32.5% used news search platforms.

About 93.9% (76) informed that they usually read books, with literature as the main theme (34.6%). All participants who indicated that they did not have this habit worked night shifts.

What internet access is concerned, 75.3% (61) mentioned using it. Obtaining news in general or different kinds of information was the most frequent reason. A slight difference was found between the shifts, with 79% of day and 73.7% of night shift workers frequently accessing the internet.

As to exposure to violence, 84% (68) denied any involvement in these situations. According to them, the greatest exposure occurs on the streets and neighborhood around the USP/UH. They mentioned theft/pilfering (6.2%), verbal aggression (4.9%) and traffic accidents (2.5%).

When asked about drugs use, 34.6% (28) indicated they had never used any kind of drugs (alcohol, tobacco, marijuana, crack, cocaine, injectable drugs, glue, tranquilizers and stimulants). Nevertheless, alcohol and tobacco were the most used drugs, with the latter occupying the first place.

#### Their work conditions

Most participants (91.4%) in both shifts mentioned they chose their work hours and considered themselves satisfied. About 69.1% (56) indicated they worked a fixed shift and did not need to change their work hours. This would represent a harmful and exhausting factor with respect to the health-disease process, as inconstant work practices jeopardize the maintenance of the homeostatic balance established by the sleep-wake cycle<sup>(8)</sup>. Only 17.3% (14) informed that they also worked at another hospital, which evidences the possibility of greater exposure to biological and mental exhaustion in comparison with people who have one job only. From the total group, 34.6% (28) worked more than 12 hours per day.

#### Aspects that can influence vulnerability to tuberculosis

With respect to vulnerability to tuberculosis, this included aspects related to the professionals'

knowledge about the disease, as well as their knowledge access and frequency of care delivery to tuberculosis carriers, broadening the individual vulnerability concept<sup>(4)</sup>.

As to transmission form, 58% (47) considered that the probability of catching the tuberculosis bacillus simply by talking was low. In fact, besides inhalation of the bacillus, the disease needs an impaired immunological system to develop. About 5% of infected persons can get ill, although the reasons for this have not been fully clarified<sup>(9)</sup>. However, some factors have already been established, the most important of which are, as mentioned above, those directly interfering in the host's immunity, such as malnutrition, alcohol abuse, advanced age, stress, Aids, diabetes, gastrectomies, chronic renal failure, silicosis, paracoccidioidomycosis, leukoses, tumors, use of immunodepressive medication, among others<sup>(9)</sup>. It should be emphasized that a majority of these conditions results from certain living conditions. Moreover, the bacillus load, its virulence and the organism's hypersensitivity state also interfere in the development of the disease<sup>(9)</sup>.

Although most participants correctly answered the question about transmission through conversation with people in general, it is remarkable that many interviewees considered contamination either very probable (30.9%, n=25) or impossible (7.4%, n=6), as these are health professionals. As to those who mentioned that transmission was impossible, 58% were nursing aids, 12.9% nursing technicians and 25.8% nurses. This is a source of concern, as participants were health professionals who, theoretically, should know how the disease is transmitted, independently of what professional category they belong to. When comparing the work shifts, we found that 42.1% of the workers gave a wrong answer to this question.

When asked about the possibility of contamination when talking to a tuberculosis carrier, 71.6% (58) answered this was very probable. However, 23.5% (19) considered low probability, 52.6% (10) of whom surprisingly were nurses, while 2.5% believed this contamination was impossible.

Moreover, we asked about the possibility of transmission through conversation with a tuberculosis carrier under treatment, with 65.4% (53) answering that the probability was low. During treatment, bacillus populations and the number of expelled bacilli are reduced. Nevertheless, despite the treatment, the

patient can still eliminate bacilli<sup>(9)</sup>. It should be highlighted that 13.6% (11) mentioned contamination was impossible, while 3.7% (3) could not answer the question. This again evidences the need to offer information to this group of workers, as disease control also depends on them. Moreover, 14.8% (12) indicated that contamination was very probable. It should be emphasized that there is no risk for contacts when the index case starts to use chemotherapy adequately for at least two weeks<sup>(9)</sup>. The probability of catching a tuberculosis infection is related to the density of organisms in the environment at a given time, which may be related to the patient, to drugs use and to the nature itself of the environment. A series of factors are related to the person, such as the nature of the expulsive effort when coughing, the bacteriological state of the bronchial secretion, the extent of the disease and the presence of cavity<sup>(9)</sup>. It is surprising that most of the above mentioned workers were nurses (45.5% = 5). Another noteworthy aspect is the fact that about 23.2% of day and 34.2% of night works answered this question wrongly.

On the other hand, about 87.7% of the interviewees considered that the transmission of the bacillus through carriers who were not receiving treatment was highly probable. Again, it is remarkable that 11.1% (9) mentioned low probability, 55.6% (5) of whom were nurses, while 1.2% (1) manifested this was impossible. This once again exposes the lack of knowledge about this issue. Of all nurses, 20.8% (5) believed the probability of transmission was low, while about 13.9% and 10.5% of day and night shift workers, respectively, gave a wrong answer to this question, in line with our findings for the previous question.

As to the possibility of contamination through the use of personal objects (cups, plates, cutlery etc.) used by sick persons, 49.4% (40) mentioned high probability and 25.9% (21) low probability, against 22.2% (18) for impossibility. When analyzed in terms of professional category, it was evidenced that, although a large majority of inadequate answers came from workers with lower education levels, we observed that the remainder, whose education level in theory should support adequate knowledge, also presented high percentages of wrong answers. The highest frequency of wrong answers was found among workers at the Rooming-In unit (maternity), followed by Material Center and ICU workers. These results evidence that nursing professionals still share the old belief that tuberculosis contamination can occur by

using the patient's personal objects. Now, this transmission form is reduced, as people need to inhale the bacilli suspended in the air to get contaminated. Bacilli deposits can be found on objects. This makes ingestion more probable than inhalation, making it impossible for them to reach the lungs, get installed and reproduce. When patients talk, cough or sneeze, they eliminate particles of different sizes, which can contain the bacillus. However, only bacilli suspended in the air reach the alveoli and start the primary lesion<sup>(9)</sup>, while the largest particles tend to be deposited on the floor and mixed with dust, while the smallest float in the air<sup>(9)</sup>. The atomization of secretions to constitute contaminating particles is related with the sputum's physical-chemical characteristics and the vigor of the cough. Thus, thick and adherent sputum produces a lesser quantity of infecting particles, as opposed to more liquid types. Only 1% of the bacilli in suspended droplets survive for a couple of hours, provided that they are in unventilated locations that are not exposed to sunlight, which is fatal for the bacillus. Hence, the main entry door is through the pulmonary alveolus.

Moreover, with respect to transmission, we found that the nursing workers considered contamination was probable when sleeping in the same room (95.1%) and living in the same house (88.9%) as the patients. It is a fact that the probability of infection is higher among contacts inside than outside the home. There exists a direct and statistically significant relation between proximity (same bed, same room, same house) and relationship (mother, father, siblings and other relatives) on the one hand and infection and the disease among communicants on the other<sup>(9)</sup>. Other important factors are the ventilation conditions in the environment the transmission is established in. Ventilated environments in which air is constantly replaced provide more safety in contamination prevention<sup>(9)</sup>.

Almost half of the sample (46.9%) knew someone who had or was having tuberculosis, and 90.1% (73) had already delivered care to a tuberculosis patient. About 27.2% (47) mentioned care delivery to tuberculosis carriers at least once every six months and 22% at least once per month. A considerable number of professionals mentioned care delivery to these patients at least once per week (6.2%). About 43.2% indicated they did not have this experience in daily work. Literature reports higher probabilities of catching the disease among health

professionals who are directly involved in care<sup>(10)</sup>, which is why this can constitute a tuberculosis vulnerability indicator in the study sample. In terms of professional category, nurses revealed to be more frequently involved in care for tuberculosis patients. The largest number of workers with previous tuberculosis care delivery experience was found at the ICU and Medical Clinic.

In the group of interviewees who mentioned this experience, 48.1% (39) found themselves sufficiently prepared to do this. Those participants who indicated they felt unprepared because of insufficient knowledge appointed prevention modes as the most precarious aspect. Most of them worked at the Pediatric unit, where an important number of professionals reported they had delivered care to tuberculosis patients before: 61.5%.

When asked about the attitude they would assume if a colleague/friend/relative had tuberculosis, 96.3% (78) mentioned they would not like to change jobs and/or places the patient attended. Only 1.2% (1) would like the patient to change places, 55.6% (45) would not remain in the places the patient attended and 95.1% (77) would support the person.

About 76.5% (62) indicated that, at work, they could talk openly, i.e. without prejudice, about tuberculosis and Aids, while 70.4% (57) reported they could only talk about tuberculosis sometimes. Among those who mentioned talking about the subject was impossible, 75% (6) belonged to the night shift.

As to the opportunity to obtain and share knowledge about the disease, 48.1% (39) indicated they had never had the opportunity to learn anything about tuberculosis at work. This information is extremely relevant and directly relates to the quality of nursing care. However, 19.8% mentioned that the opportunities they had had were excellent and allowed for attitudinal changes towards the disease and ways of care delivery to patients. On the other hand, most interviewees (74% = 60) reported they had had contact with the theme tuberculosis through television, newspapers or magazines, although 22.2% (18) considered they had made insufficient use of this contact, without adding any new information.

## DISCUSSION

The sample includes some indicators of potential vulnerability to tuberculosis, such as long

professional experience at a hospital unit and working more than 12 hours per day (including another job). The length of the work period in the health area is important, as it evidences the time of exposure to disease-causing agents, including the one that causes tuberculosis. In a study of professionals who worked in this area, it was observed that 40% of tuberculosis cases occurred in the first 2 years after admission<sup>(11)</sup>. Another research, at a reference outpatient clinic for pulmonary diseases and tuberculosis of the São Paulo State Health Secretary, demonstrated that professionals who had worked longer at the institution were all reactive to the tuberculin test five years<sup>(9)</sup> after their admission.

Data evidenced that the nursing aids present a higher number of vulnerability indicators, as well as night shift workers in general. Some information would obviously have to be explored in greater depth in order to qualify more appropriately how work processes are carried out, in order to get a more proper understanding of issues directly associated with strengthening and/or exhaustion, such as the way technical and social relations are processes at work, including their division, the command line, besides others that can interfere in the disease process. Another important aspect refers to the distinct potentialities of strengthening and/or exhaustion in different professional categories, as nursing aids will very possibly display a greater chance of getting ill, due to their peculiar living and work conditions, resulting from their own insertion as a social group.

According to the obtained results, what vulnerability to tuberculosis is concerned in relation with knowledge about the disease, it could be observed that, although most participants presented a certain degree of knowledge, considering that they are health professionals who should have proper training in order to work in this area, everybody would be expected to be able to answer basic questions about the disease, for care delivery as well as for the adequate use of precaution forms. We observed erroneous and mistaken concepts in knowledge about the disease and its transmission form, depending on the professional category and the work unit the professionals were active at, particularly at the Rooming-In unit, Material Central and ICU. Moreover, it is highlighted that an important part of the sample indicated that they did not feel sufficiently prepared to deliver care to tuberculosis patients. This reveals the need to invest in educative actions, to be implemented by institutional

continued education services, looking at the care approach with a focus on professional protection and prevention of cross-infection, as established by the Centers for Disease Control (CDC), whose resolution recommends, for diseases whose microorganisms are transmitted through aerosols, specific precautions in terms of hospitalization site, respiratory protection (masks filtering particles measuring = 5µm) and patient transport<sup>(12)</sup>.

We can conclude that a part of the workers, even if small, presents an important vulnerability level to tuberculosis, which reveals the need for the service to play this role for these workers, training them in terms of intervention strategies, incorporating prevention and care actions and making available material resources to execute them. The World Health Organization (WHO) recommends that institutional responsables support tuberculosis control programs, appointing that at risk sites, including the nosocomial environment, both institutions and health workers should assume particular responsibility should be assumed to implement control measures<sup>(13-14)</sup>. The fact that the disease mainly affects people in the economically productive age, besides causing the unavoidable suffering of the disease itself, reduces productivity and can entail the need to temporary replace the work force, besides the need to train new workers, which means an important indirect cost. In this respect, the WHO indicates that, at global level, tuberculosis decreases productivity by about 12 billion dollars every year and also results in a potential family income reduction by about 20 to 30%<sup>(14)</sup>.

Although we found no important difference between the day and night shifts, we suggest further research, using statistically appropriate measures, as

this is a powerful vulnerability variable, as this factor does not only change the biological system, but also impairs the individual's social dynamics, as night shift workers are obliged to use what should be their rest hours to respond to daily events: society and the family still functions at a traditional daytime activity rhythm<sup>(8)</sup>. The night shift limits or makes the worker's participation in associations, organizations, parties and unions etc. impossible. Moreover, the rest periods made obligatory by the shift system generally do not occur at weekends, which substantially changes the utility of this free time. This creates feelings of disadvantage and even social isolation in most workers<sup>(6)</sup>.

Although some professionals work night shifts because they choose to and adapt easily, in view of the above, all earlier described transformations can be considered as destructive factors (counter-values) in the health-disease process since this shift, in general, is imposed and accepted, given existing difficulties in the job market.

We also suggest a research with a larger population sample, besides the application of a tuberculin test to detect clusters of professionals who, after a period of time, can present PPD conversion, with a view to the implementation of disease control, protection and prevention standards for workers at this institution.

There is a need for increased awareness about the fact that tuberculosis can be properly cured and that health workers can also be susceptible. They should be stimulated to seek emergency care in case of compatible symptoms, without fear of any kind of censorship, considering the need for an active search of cases, including in the intra-hospital environment.

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