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# CLINICAL SYMPTOMS AND LABORATORY FINDINGS of COMMON INFECTIONS IN GERIATRIC POPULATION IN TEHRAN (CASE STUDY)

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## ABSTRACT

The potential for infection in geriatric population increases to the high rates of infections, the mortality and disability resulting from them and the various signs of infection in the elderly, which can lead to delays in diagnosis. This study was designed to evaluate the clinical symptoms and laboratory findings of infectious diseases in elderly patients hospitalized in infection ward in one of the medical centers of Tehran province. This descriptive study was conducted on 256 elderly patients with an infectious disease in one of the medical centers of Tehran province in 2016. The detection of a fever or a specific infection site in the examination was the criterion for the early diagnosis of the infectious disease. Medical history and physical examination were taken from all of the patients, and laboratory tests including blood culture (CBC, ESR, CRP), urine culture (Color, appearance, specific gravity, Protein, Glucose, Keton Aceton, Blood) diagnostic imaging including sonography, CT scan and MRI, were performed. Then, the questionnaire containing demographic data, clinical symptoms and laboratory findings was completed by interviewing the patients and reviewing their records. The results were presented as descriptive statistics. In this study, out of the 256 patients participating in this study, 135 (53.6%) were male. The average age of patients was 74.3 years old, in which most of them (48.4%) were in the age group of 60-75 years old. The most common complaints were fever (19.4%) and dyspnea (14.9%) and the most common underlying disease was hypertension (37%). The most common infectious diseases were pneumonia (23.4%) and sepsis (15.7%), respectively. The most common infectious diseases leading to hospitalization and death in the elderly are pneumonia and sepsis.

**KEYWORDS**: *geriatric population, Common infections, Hospitalization, laboratory finding, symptom.*

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# INTRODUCTION

Old age is a complex process that occurs in all living creatures. These changes begin with birth and continue throughout life[1]. Old age is a period that is associated with increased sensitivity to infections. In old age, especially 60 years and above, there are many reasons for frequent infections that arise from changes that occur in humoral and cellular immunity. Physiological changes such as reduction of cough reflux, circulatory disorders, and slow healing of wounds are also the factors that increase the risk of infections in the old age[2-5]. The increase of chronic diseases that their incidence increases is due to old age, and collective living in the nursing home. Today, it has been well documented that many of the infections are more common in the elderly, such as shingles, listeriosis, and urinary tract infections, and are associated with higher mortality, such as bacteremia and meningitis[5]. The Geriatic population constitute a large and growing part of the world's population.Social-health advances in the present century have led to unprecedented developments in demographic indicators and epidemiological studies; Thus, the life expectancy, the average years that a person can expect to survive, has greatly increased. This increase is indicative of the growing population of Geriatic population globally[6]. Much of the cost of healthcare is spent in the last few months before the death of the elderly, and the length of stay of the seniors in the hospital is longer than that of the youth[3]. Old people have higher hospital costs and mortality rate than younger people, and infections are one of the most common reasons for hospitalization and transferring them from the nursing home to the hospital. Urinary tract infections, pneumonia, abdominal infections, sepsis and pressure ulcers are common among the elderly and account for hospitalization[2-5]. Many of the physiological responses to infection in the elderly are slow. The increase in temperature, the maximum leukocyte counting formula, and the severity of many clinical symptoms and signs of infection are not significant, and in some cases, this delayed the diagnosis and lead to their death even before being diagnosed and treated for infections[4]. In the study by Rasoulnezhad in Tehran, on 101 Geriatic population aged 65 to 92 years who were hospitalized in the infectious ward of Imam Khomeini Hospital due to fever, the most common infectious diseases were pneumonia and urinary tract infection[7].In the study by Alimagham, by reviewing the records of 975 patients over 65 years of age hospitalized in the infectious ward of Shahid Beheshti University hospitals in 2001-2002, the most common infections were pulmonary, urinary and digestive tract infections[8]. The Htwe et al., in US, cited the skin and soft tissue infections, urinary tract infections, respiratory infections,and gastrointestinal infections are the common infections in the elderly[2]. In the study by Mouton et al., on elderly in Texas, urinary tract infection was identified as the most common cause of bacteremia and incidence of infectious disease. Given the high prevalence of infections and the complications of mortality from them and also the different signs of infection in the elderly, which can delay the diagnosis, and since a similar study has not been done in this area, this study was designed in 2016 to investigate the clinical symptoms and laboratory findings of infectious diseases in the elderly hospitalized in the infection ward in one of the medical centers in Tehran province to identify the various clinical signs of infections.

# MATERIALS AND METHODS

This descriptive study was conducted on 256 Geriatic population (60 years and above) who were hospitalized in the infection ward in one of the medical centers of Tehran from the beginning to the end of the year 2016. Sampling was done as a census and based on the objective. The inclusion criterion was the age of 60 or older and hospitalization in the infection ward of Beheshti hospital with a possible diagnosis of infectious disease. The primary criterion for the diagnosis of infectious disease was the presence of fever, finding the local infection site in the initial examination and the clinical suspicion of an infectious disease. After hospitalization, the medical history and physical examination were taken from all patients,and necessary laboratory tests and imaging were performed based on the clinical suspicion in each case in order to achieve the diagnosis. U/A, CRP, ESR, CBC, Cr, BUN, FBS and CXR tests were performed on all patients, blood and urine cultures on all patients with fever, Wright and Coombs Wright and 2ME on all patients with prolonged fever and positive epidemiological history of brucellosis, smear and sputum culture in terms of BK in three cycles, and CXR and PPD test for patients with prolonged fever and cough suspected of having tuberculosis,smear and culture of wound secretions in cutaneous infections, graph and MRI of the vertebrae and spine or bones in cases of suspension to osteomyelitis and spondylitis, abdominal and

pelvic ultrasonography in cases of suspension to cholecystitis or abdominal abscesses and urinary tract infection. First, given that the elderly are at higher risk of infection and mortality complications from it, experimental treatment was started on the basis of the initial diagnosis of the physician. The final diagnosis of the disease was given based on clinical symptoms and physical findings, and the results of laboratory tests and imaging, based on infectious reference sources, as follow

***PNEUMONIA***

The presence of clinical symptoms such as coughing and sputum and physical findings, such as hearing rales in the lungs and CRX changes.

***PYELONEPHRITIS***

Clinical signs such as fever, pain in the flanks, frequent and burning urination, and presence of pyuria in the complete urine test (if the urine culture is positive, the type of organism causing the urinary tract infection was identified).

***SEPSIS***

The presence of at least two signs of the four signs of SIRS, including fever T<36, tachycardia PR>90, tachypnea PR>20, leukocytosis WBC>12000 or leukopenia WBC<4000 or >10% bands in a person with a clinical suspicion of infection.

***INFLAMMATORY GASTROENTERITIS***

Clinical symptoms such as diarrhea, tenesmus, fever, and the presence of WBC in the stool test.

***TUBERCULOSIS***

Epidemiology such as Afghan nationality and the history of contact with an affected person, clinical symptoms such as prolonged coughing and the presence of at least two sputum smear-positives in terms of mycobacterium tuberculosis or one period of smear-positive and abnormal findings in the chest radiography.

***BRUCELLOSIS***

Clinical symptoms such as prolonged fever, perspiration, headache, low back pain and positive serum agglutination tests with wright >1.160 or coombs wright and 2ME>1.80.

***OSTEOMYELITIS***

Clinical signs such as pain, the presence of fistula and imaging findings in simple radiography or MRI.

***DIABETIC FOOT***

Clinical signs such as pain and swelling and redness and the presence of purulent discharge and necrosis in the wound in a patient with diabetes.

***HEPATITIS***

Clinical symptoms such as stomach ache and jaundice, anorexia and at least 8 times increase of the hepatic enzymes.

***COPD***

An increase in coughing and phlegm,or dyspnea or fever in a person who has already been diagnosed with chronic obstructive pulmonary disease. Chest radiography also shows some changes.

***VIRAL INFECTION***

Clinical symptoms such as fever, myalgia, headache without finding the local infection site in the examination, and ESR, normal CBC and CRP tests, negative urine and blood cultures. The duration of hospitalization of patients varied based on how they responded to the treatment and breaking of fever and type of the disease, except for patients with osteomyelitis who needed long-term treatment with injectable drugs and patients who had complications. Other patients, if their fever had stopped for 48 to 72 hours and their clinical symptoms had subsided, were discharged as outpatients with oral medication and requirement for continuing the treatment. Demographic data, clinical symptoms and laboratory findings of the patients were collected and entered into the questionnaires through interviewing the patients, reviewing medical history and observing the results of their paraclinical tests. Data were entered into the SPSS software and the results of analysis was presented using descriptive statistics.

***FINDINGS***

In this study, out of 256 geriatric patients, most of the patients were male (53.6%) and in the age group of 60-70 years(48.4%). Most of the elderly with an infectious disease were living in the city (69.4%) and had no history of hospitalization (52.8%). 38.5% of the elderly were hospitalized for the first time and 5% of them had a history of being hospitalized more than 5 times. Most of the elderly patients (54.8%) had hospitalized for 5 days or less, and only 7.7% of them had hospitalization duration of 15 days or more. The most common complaints were fever (19.4%), dyspnea (14.9%), and coughing (12.5%), respectively. 128 patients (51.6%) had more than one underlying disease. The most common underlying diseases were hypertension (37%) and then diabetes (52.8%). 98% of the patients (243 patients) were discharged

from the hospital with recovery and only 5 patients died (2%) (Table 1). Physical examination was normal in most of the subjects (35.9%). The most abnormal physical findings were rales (21%) and abdominal tenderness (10.9%), respectively. 27 patients (11.2%) had creatinine of more than 5.5 mg/dl, 40 patients (21.2%) had pyuria and 88 patients (35.4%) had hemoglobin of less than 12. Leukocytosis was found in 40.7% of cases, increased ESR in 58.6% of cases, and positive CRP in 69.8% of cases (Table 2). The most commonly diagnosed diseases among the elderly were: pneumonia (23.3%), sepsis (15.7%), gastroenteritis (10.9%), viral infection (9.6%), urinary tract infection (6.6%), respectively (Figure 1).

**Table 1**
***Characteristics of the elderly hospitalized in the infection ward in one of the medical centers of Tehran province in 2016***

| | | Number | Percentage |
|---|---|---|---|
| | 60-75 | 154 | 48.4 |
| | 75-85 | 76 | 39.1 |
| | 85-95 | 35 | 12 |
| | ≥95 | 2 | 0.4 |
| Gender | Male | 133 | 53.6 |
| | Female | 117 | 46.4 |
| Residence | Urban | 176 | 69.4 |
| | Rural | 73 | 30.6 |
| History of hospitalization | Yes | 115 | 47.2 |
| | No | 124 | 52.8 |
| Underlying disease | Diabetes | 76 | 25.8 |
| | Hypertension | 55 | 37 |
| | Hyperlipidemia | 79 | 25.4 |
| | Ischemic heart disease | 63 | 24.6 |
| | Chronic kidney failure | 2 | 3.2 |
| | Others | 76 | 32.6 |
| Hospitalization duration | 1-5 days | 136 | 54.8 |
| | 5-10 days | 45 | 27.4 |
| | 10-15 days | 21 | 10.1 |
| | > 15 days | 23 | 7.7 |
| Prognosis | Recovery | 267 | 98 |
| | Death | 4 | 2 |

**Table 2**

***Frequency distribution of laboratory results of elderly patients hospitalized in the infection ward of one of the medical centers of Tehran province***

| Laboratory findings | Description of laboratory findings | Number | Percentage |
|---|---|---|---|
| CBC | Leukocytosis | 134 | 40.7 |
| | Normal | 156 | 59.2 |
| ESR | Less than 20 | 198 | 40.3 |
| | 20-100 | 146 | 56 |
| | More than 100 | 7 | 3.6 |
| CRP | Negative | 58 | 31.2 |
| | +1 | 29 | 15.8 |
| | +2 | 28 | 15.2 |
| | +3 | 61 | 33.9 |
| | +4 | 6 | 3.9 |
| Urine culture | Positive | 12 | 10.1 |
| | Negative | 78 | 89.9 |
| Blood culture | Positive | 5 | 3.5 |
| | Negative | 128 | 96.4 |

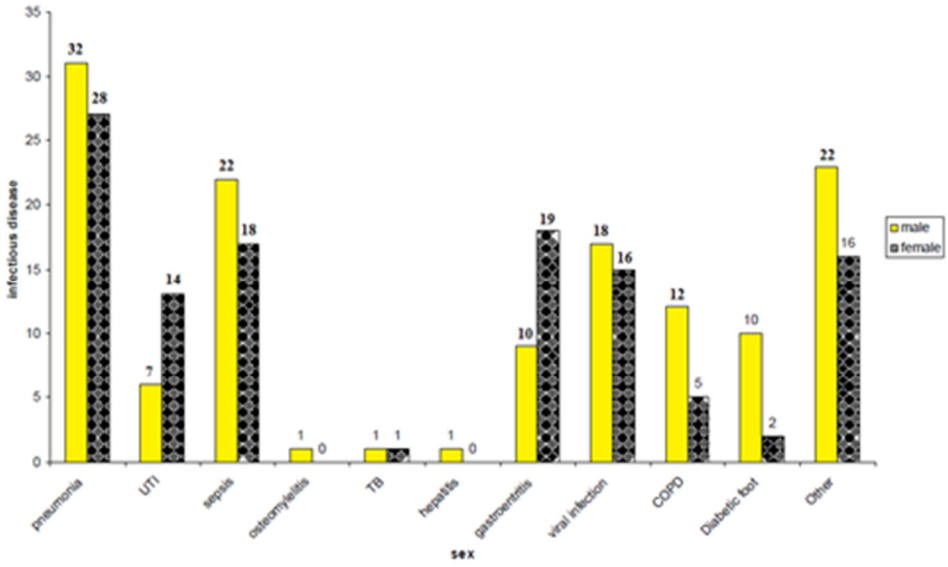


**Figure 1**

***Frequency distribution of common infections in the elderly hospitalized in the infection ward of one of the medical centers of Tehran province in 2016***

## DISCUSSION

In this study, the most common infectious disease leading to hospitalization of the elderly was pneumonia. In the study by Rasoulinejad, on 101 elderly patients hospitalized in Imam Khomeini Hospital of Tehran during 6 months, the most common causes of fever were pneumonia, cellulitis, urinary tract infections and sepsis,. In the study by Alimagham, on 975 elderly patients in Shaheed Beheshti University hospitals, respiratory system, urinary system and digestive system infections were the most common infections[8]. In the study by Marco CA et al. (1995), on 470 elderly patients with fever during 12 months, the causes of fever were as follows: pneumonia (24.9%), urinary tract infection (21.7%), septicemia (17.7%), cellulitis (9.4%), meningitis (1%), fever with an unknown source (5.7%), malignancies (0.6%), respectively[10]. In the study by Asefzadeh et al., in Bu-Ali Hospital of Qazvin, pneumonia was also the most common infectious disease (20% of cases)[11]. The results of these studies are consistent with our study, indicating that pneumonia is the common cause of infectious diseases for hospitalization of the elderly, and therefore, pneumonia should be included in the

differential diagnosis of all febrile Geriatic population as a major cause of fever. Concurrent influenza and pneumonia is the infectious cause leading to the death in the elderly and is the fourth cause of death in the elderly in general. The presence of concurrent disease and delayed diagnosis are specifically associated with increased mortality in the elderly[12].In this study, sepsis with 42 cases (15.7%) was in the second place in terms of prevalence. In the study by Alimagham, sepsis was observed in 42.2% of patients, which is higher than that of our study, and in the study by Asefzadeh, septicemia was observed in 13.3% of patents, which is somewhat close to our study[8,11]. Sepsis is a common cause of hospitalization of elderly, due to blindness of the response to infection in the elderly, sepsis can only occur with complaints of weakness and anxiety, therefore, in any changes in the functioning of the elderly, sepsis should be considered as an important cause[5].In our study, 27 patients (10.9%) were hospitalized for gastroenteritis. In the study by Rasoulinejad, 4% of gastroenteritis was reported[7]. Infectious diarrhea may be associated with abnormal immune function. Intestinal infectious disease is a group of preventable diseases that causes significant morbidity and mortality in the elderly. Food and measures of controlling the infection, especially in institutes, help in reducing the incidence of intestinal infectious diseases[13]. Viral infection in 24 cases (9.7%) and urinary tract infections in 19 cases (7.7%) were in the next place. Urinary tract infections are the most common infectious diseases in the elderly, especially disabled people who live in institutions, and unlike young people, It is more difficult to treat them and their pathogenesis is associated with abnormal bladder function, bladder outlet obstruction, vaginal and urethral atrophy, and long-term catheter use[14].Common infections in the elderly include soft tissue infections, urinary tract infections, respiratory and digestive infections. Many of the demographic, functional and immunological changes associated with aging are responsible for increasing the incidence and severity of infectious diseases in the elderly[2]. Three cases of tuberculosis were observed among our patients. In the study by Rasoulinejad, 5% of febrile elderly had pulmonary tuberculosis[7]. Acute and chronic underlying diseases, malnutrition, and biological changes associated with aging can disturb the microbial clearance mechanism by damaging the immune dams and play a role in may contribute to the age-related reduction of cellular immunity against infectious agents such as mycobacterium tuberculosis[15]. The bacterial infection spectrum varies depending on the severity of the infection and whether the patient is admitted to the hospital or a nursing home or lives in a community. Pneumonia, urinary tract infections and pressure ulcers are more common in elderly living in nursing home than those living in the home. Infections are a common cause of hospitalization of the elderly, and on the other hand, hospitalization itself is a risk factor because of hospital infections that is caused by invasive diagnostic measures and frequent use of urinary catheter. Infection in the elderly is associated with serious complications such as bacteremia (pneumonia), recurrent infections (urinary tract infection), perforation and abscess (intra-abdominal infections), and severe impotency (pressure ulcers). Due to these severe and common complications, mortality of infections in the elderly is higher than that of young people. In the elderly, the fever response is often blindfold even in the presence of bacteremia, and leukocytosis and increased acute phase proteins may not exist[16].Considering that many Geriatic population may refer with non-specific clinical symptoms and non-specific functional reductions makes the diagnosis difficult. We should not rely on typical symptoms of infections such as fever for diagnosis, and any changes in the function of elderly should be taken seriously, and the necessary measures should be taken to diagnose the infectious diseases, and, if suspected of having an infectious disease, treatment should be initiated immediately. One of the limitations of this study was that due to the age of the patients and the high risk of septicemia in the event of delayed treatment of infections, in most cases, antibiotic treatment was initiated before hospitalization. This leads to negative results for blood or urine cultures and definitive diagnosis of the disease's etiology was not possible.

# CONCLUSION

The most common infectious diseases leading to hospitalization and the death were pneumonia and sepsis. Since clinical signs of infection in the elderly do not appear clearly and delayed diagnosis leads to complications and death, pneumonia and sepsis should be considered in the differential diagnosis of Geriatic populationwho refer with any illness.

# CONFLICT OF INTEREST

Conflict of interest declared none.

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