HEARING DISORDER IN MULTIDRUG-RESISTANT TUBERCULOSIS PATIENTS AT THE OUTPATIENTS UNIT, PULMONARY DEPARTMENT, DR. SOETOMO HOSPITAL SURABAYA

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ABSTRACT

Until now, examination of hearing loss degree in patients with MDRTB who received TB treatment has not been done. It is important to prevent the effects of TB drugs against hearing loss or deafness. The results of the study on center TB hospitals at Beatrixoord in January 1995 through July 2000 showed the prevalence of hearing loss due to ototoxic was quite large, 41%. This study is a retrospective descriptive study to obtain the incidence of hearing loss in MDRTB patients were performed at pulmonary division Dr. Soetomo Hospital Surabaya. The data was taken from patients visited from 1 January 2009 through 31 December 2011. In general, there were 41 MDRTB patients with age range 22-60 years old. Mainly, patients were in the age group 31-40 years old (36.6%). Mostly they were treatment failure patients, 18 people (44%), relapsed patients as many as 13 people (31.6%), and inattentive 10 people (24.4%). From the anamnessis, hearing complaints obtained at 19 people (46.3%), and 22 people (53.7%) did not feel any complaints. Using audiometric examination, found mild hearing loss in 39 ears (48%), moderate 20 ears (24%), moderate severe 3 ears(4%), severe 1 ear(1%), very severe 12 ears(15%), and normal only 7 ears(8%). While the examination obtained by using OAE, there were 23 ears(28.04%) with normal cochlea, 45 ears(54.87%) suffered cochlea disorder, and 14 ears(17.07%) were not examined. Kanamycin injections as TB drugs suspected to result ototoxic, resulting in hearing loss in MDRTB patients.(FMI 2013;49:263-267)

Keywords: Multidrugs-Resistant Tuberculosis, Ototoxic, Audiogram, Otoacoustic Emission

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INTRODUCTION

Multidrugs resistant tuberculosis (MDRTB) is the main problem of preventing and eradicating of TB. Among TB patients visited the outpatients unit in Dr. Soetomo Hospital at 2009-2011, 26% of them suffered MDRTB (Soepandi 2010). The prevalence of hearing disorder due to ototoxic was quite large at 41%. These results were achieved from a study on TB hospitals in Beatrisoord center at January 1995 to July 2000. While the degree of deafness has not been recorded, the hearing examination in patients with MDRTB is very important to prevent the drug effects of TB in hearing disorder or deafness. When loss hearing symptoms are detected, progressivity prevention and overcome the signs should be done immediately in order to avoid progressive hearing disorder (Jager & Altena 2002).
MDRTB patients suffering ototoxicity that have hearing disorder have been suspected as results of high load kanamycin injection. Therefore, hearing examination should be routinely done to MDRTB patients (Mudd 2008). Hearing disorder can be detected by audiometry. Function disorder in outer cochlea hair cell can be detected by otoacoustic emissions (OAE), with evaluating cochlea response in high frequency which is sensitive frequency to detect ototoxicity (Duggal & Sarkar 2007). Incidence of hearing disorder suffered by MDRTB patients in Dr. Soetomo Hospital has not been known. Therefore, this study will discuss hearing examination results of MDRTB patients in outpatients division Dr. Soetomo Hospital Surabaya.

MATERIALS AND METHODS

This study was a descriptive retrospective study conducted in MDRTB patients and treated in the Department of Pulmonary Dr. Soetomo Hospital Surabaya. The data used in the form of registration data and the patient's medical record from 1 January 2009 through 31 December 2011. MDRTB diagnosis was determined based on the results of anamnese, physical examination, and the results of investigations by the audiogram and OAE.

RESULTS

In the period between January 2009 to December 2011, it was collected 41 MDRTB patients. Most patients between the age group 31 years to 40 years (36.6%), followed by the age group between 41 years to 50 years (26.8%). Youngest patients aged 22 years and the oldest 60 years old (Table 1).

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Male</th>
<th>Female</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>21-30 years old</td>
<td>1</td>
<td>6</td>
<td>14.6</td>
</tr>
<tr>
<td>31-40 years old</td>
<td>6</td>
<td>9</td>
<td>21.96</td>
</tr>
<tr>
<td>41-50 years old</td>
<td>5</td>
<td>12.2</td>
<td>14.6</td>
</tr>
<tr>
<td>51-60 years old</td>
<td>5</td>
<td>3</td>
<td>7.3</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>24</td>
<td>58.45</td>
</tr>
</tbody>
</table>

The results obtained from the history taking, most MDRTB patients were treatment failure patients, amounting to 18 people (44%). Patients with relapsed obtained as many as 13 people (31.6%), and as many as 10 people were neglect patients (24.4%). (Figure 1). Hearing Disorder. The results of anamnese, hearing complaints suffered by 19 persons (46.3%), and no hearing loss by 22 people (53.7%) (Figure 2).

DISCUSSION

MDRTB shows that Mycobacterium tuberculosis resistant to rifampicin and INH with or without other anti-tuberculosis drug. In general, resistance to tuberculosis drug is said to be primary resistant if the person had never received treatment for TB. While the initial resistance means not known for sure whether the person had been no history of previous treatment or not, and secondary resistance if the person has had a history of previous treatment. Best effort that should be done is to prevent MDRTB occur because people get infected
directly from people who have MDRTB (World Medical Association 2008b).

![Figure 3. Audiometri test result of MDRTB patients](image)

Figure 3. Audiometri test result of MDRTB patients

Selection of regimens in the treatment of MDRTB may consist of combination mixture of standard drugs and second-line drugs. The choice of drugs depends on the interpretation of the data collection of each individual person. Standard anti-tuberculosis drugs consisting of streptomycin, pyrazinamide, ethambutol, and thiazetazon. While the second line anti-tuberculosis drugs are aminoglycosides (amikacin, kanamycin, capreomycin), thiomide, fluoroquinolones, Cycloserine. MDRTB out patients division in Dr. Soetomo Hospital using kanamycin as an alternative therapy in patients MDRTB (World Medical Association 2008b, Curry 2006).

MDRTB patients who went to the Dr. Soetomo hospital16 of 24 women patients are in childbearing age, which ranges in age from 20 years to 45 years, that chance of pregnancy and childbirth. It needs to concerned the influence of drugs against ototoxicity MDRTB fetus. Pregnancy is not a contraindication drug use MDRTB. However, the administration of drugs MDRTB postponed after the first trimester, it is because the drug is teratogenic MDRTB. Use of MDRTB drug injection, which should be avoided due to the nature of aminoglycoside ototoxic, capreomycin can be used as an alternative choice if in forced to be injected (World Medical Association 2008b, World Medical Association 2008a). While about 75 % of TB patients are the age group most economically productive (15-50 years). In addition to adverse economic, TB also provide other harm which is socially stigmatized and even ostracized by society (Ministry of Health, Republic of Indonesia 2009).

From the results it was found that most of the history of type Dr. Soetomo Hospital MDRTB patients is treatment failure patients, amounting to 18 people (44 %). Patients with relapsed obtained as many as 13 people (31.6 %), and patients with inattentive/end treatment as many as 10 people (24.4 %). Patients with relapse (relapse) is a TB patient who had previously received treatment for TB and has been declared cured or complete treatment, re-diagnosed with smear-positive (smear or culture). Disconnect treatment (default) is a patient who has been treated and broke up 2 months or more of treatment with smear positive. Failure is a patient who remained positive sputum examination results or return to positive in the fifth month or more during the treatment society (Ministry of Health, Republic of Indonesia 2009). A high rate of failure in the treatment of TB is equal to 44 % due to TB treatment is less known by the public, unguaranteed provision of drugs, not doing the monitoring, recording and reporting standards, incorrect perceptions of the benefits and effectiveness of BCG (World Medical Association 2008a, Ministry of Health, Republic of Indonesia 2009).

From the results obtained in the history taking, MDRTB patients were admitted to a decrease in hearing after receiving kanamycin therapy as many as 19 people (46.3 %), and there were 22 people (53.7 %) claimed no hearing loss. It turned out that after the examination using the audiogram obtained hearing loss in 75 ears (92 %) and normal only in 7 ears (8 %). While examining using the OAE obtained the pass was 23 ears (28.04 %), refer gained as many as 45 ears (54.87 %) and were not examined a total of 14 ears (17.07 %). This occurs because certain people do not know and are not aware of hearing loss until it becomes severe. At ototoxic, initially occurred high frequency hearing loss that may progress to a low frequency. Hearing loss, as a symptom of hearing disorder, as a sign or symptom of primary disease or part of the disease process. Some other
symptoms that may arise following the hearing disorder is tinnitus, dizziness, impaired balance or vertigo, otalgia, and otorrhoea.

There are three types of hearing loss, in one or both ears, that can occur as a symptom, primary disease symptom, or part in onset of disease. There are three types of hearing disorder which is conductive, sensorineural, and mixed (Curry 2006). Sensorineural deaf is distinguished into cochlear and retrocochlear, while mixed deaf is combination both conductive and sensorineural deaf (Meyerhoff & Carter 1984).

Ototoxicity is damage to the cochlea or auditory nerve and the vestibular organ function sends balance and auditory information from the labyrinth to the brain caused by chemicals or toksin (Meyerhoff & Carter 1984, Duggal & Sarkar 2007). Some medications can cause toxic reactions in the structure of the inner ear, including the cochlea, vestibule, semicircular canals, and otolith regarded as ototoxic. Drugs can induce auditory structure and balance system that can cause hearing loss, tinnitus, and dizziness. Hearing loss due to toxicity sometimes temporary but most are settled in usage group Aminoglikosida (Meyerhoff & Carter 1984).

Ototoxicity is a major concern with the discovery of streptomycin by physician in 1944. Streptomycin success in the treatment of tuberculosis, but otherwise most of treated people had irreversible cochlear dysfunction. This discovery correlated with amino glycosides toxicity associated with ototoxicity causes clinicians and scientists researching the etiology and mechanism of ototoxicity. Now, many drugs are known to have toxic effects on cochlear system (Meyerhoff & Carter 1984, Duggal & Sarkar 2007).

Mechanism due to ototoxic deafness remains unclear. The pathology includes loss of outer hair cells, followed by inner haircells. This led to high-frequency hearing loss which may progress to low frequency. Certain people are not aware of any hearing loss until the degree of hearing loss was severe. Ototoxic damage can also occur in ventricular cochlear nuclei in the brain stem which extends to the end of the nerve fibers in cochlea (Meyerhoff & Carter 1984).

Hearing loss can occur due to the presence of drug binding to glycos aminoglycans with vaskularis striae, which causes changes in the stria and secondary changes in the hair cells. Otoxic antibiotics cause hearing loss by converting important biochemical processes that lead to the metabolic aberrations of hair cells and can cause sudden cell death (Meyerhoff & Carter 1984, Duggal & Sarkar 2007). Histologic findings ototoxic effects of streptomycin are loss of outer hair cells are scattered in the arch above the basal cochlea, severe damage to the sensory epithelium of the crista all channels, stereosilia in the ampulla duct swelling until its diameter becomes twice as large (Meyerhoff & Carter 1984).

There are differences in auditory examination using otoacoustic emissions (OAE) and using audiometry. Examination of otoacoustic emissions conducted to evaluate the function of the outer hair cells of the cochlea. OAE wave arising in the cochlea is often referred preneural event because of the sound waves produced have not been distributed to the auditory nerve. But to find out if there is a problem of neural function along the auditory pathway remains to be examined audiogram test (Meyerhoff & Carter 1984).

Audiometry is the golden standard tool for the hearing test and measure hearing acuity. These devices are typically used to measure hearing thresholds. Audiometry imay check the level of auditory acuity correctly, quickly, and accurately. Audiometti divided into two, pure tone audiometry and speech audiometry. Pure tone audiometry is a basic test to determine the presence or absence of hearing loss. While the speech audiometry, tested how many people's ability to understand conversations at different intensities. Audiometry can generate graphs audiogram or hearing threshold for each ear at a range of frequencies. That way, the point where the smallest sound that can be heard will be known. Audiogram an record hearing capabilities of each ear at a different frequencies (Meyerhoff & Carter 1984).

The sound that comes from outside is processed by the cochlea into electrical stimulus, then sent to the brain via the auditory nerve trunk. Most of the sound energy is not sent to the auditory nerve, but back toward the ear canal. This process is similar to echo events. Byproducts of the cochlea is referred to otoacoustic emission. Cochlea not only receives sound processing but also can produce energy with low-intensity sounds originating from cochlear outer hair cells (Meyerhoff & Carter 1984).

At the OAE examination that can not be checked as much as 14 ears. This is because at the time of examination OAE around a very noisy sound, which led to the OAE can not function well. Distortion Product Otoacoustic Emissions (DPOAE) is a sound wave that occurs when the cochlea is stimulated simultaneously by two tones having different frequencies. Two tone is then agreed upon as f1 for low-frequency tones and f2 have unruk tone has a frequency higher. In response to the second stimulus tone, then the cochlea will generate
another tone at a different frequency. The resulting tone was then known as the distortion products from the cochlea. Distortion product that appears then is reflected back towards the external acoustic meatus as OAE (Babeu 2001). Equipment to record the DPOAE is a probe in the ear canal. The probe contains two loudspeakers and a microphone. Loudspeakers produce a stimulus tones with different frequencies while the microphone captures DPOAE generated by the cochlea. DPOAE received and analyzed by the spectrum analyzer system and displayed in the form of a diagram. DPOAE can occur in all normal ears will disappear when there is a sensorineural hearing loss of 50dB - 60dB (Babeu 2001).

CONCLUSION

Multidrugs resistant Tuberculosis (MDRTB) is the biggest problem of the prevention and eradication of TB. MDRTB showed Mycobacterium tuberculosis resistant to rifampicin and INH with or without other anti tuberculosis drugs. The prevalence of hearing loss due to ototoxic was quite large. Therefore, examination of hearing in patients with MDRTB is very important, because with it we can immediately determine the effects of TB drugs to a person's hearing. Ototoxic that occurs in patients with suspected MDRTB caused by injection of kanamycin. So it is necessary to obtain the incidence of injection of kanamycin and the hearing loss. Examination for hearing disorder function can be determined by audiometric test. Impaired function of the outer hair cells of the cochlea was evaluated by otoacoustic emissions (OAE), by evaluating the response of the cochlea at high frequencies which are sensitive to the frequency of detection of ototoxicity.

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REFERENCES


