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Vitamin A Supplementation in Pulmonary Tuberculosis Patients on Acceleration of Sputum Conversion in Medan City

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Abbreviations: ANOVA: Analysis of variance; BRS: brain relaxation scale; CVP: central venous pressure; MAP: mean arterial pressure; GDT: goal-directed fluid therapy; PPV: pulse pressure variation; SPSS: Statistical package for social science;

Abstract

BACKGROUND: Indonesia is in the second rank for the most TB (Tuberculosis) cases in the world after India. It is estimated that there are 1 million cases per year in Indonesia.

AIM: To find out the influence of Vitamin A supplementation in the medication of pulmonary TB on the acceleration of sputum conversion time at an intensive phase in the Working Area of Puskesmas in Medan Kota Subdistrict

METHODS: This research was Quasi Experiment method. With two groups. The samples were 30 newly diagnosed pulmonary TB patients consisting of of15 patients in the treatment group and 15 patients in the control group. The statistical data were analysed with t independent test, significance 95% ($p < 0.05$)

RESULTS: The treatment group discovered that they were mostly 18-27 years old 40.0%, male 73.3%, mostly university students 26.7%, had BTA conversion in the second week 80.0%; and the sputum conversion time was 2.4 weeks in average. The results of the research on the control group demonstrated that they were mostly 18-27 years old 33.3%, male 80.0%, mostly university students and entrepreneurs 20.0%, had BTA conversion in the second week 80%; and the sputum conversion time was 4.1 weeks in average. Vitamin A supplementation in the medication of pulmonary TB patients had some influence on the acceleration of sputum conversion at the intensive phase ($p \leq 0.001$).

CONCLUSION: We concluded that Vitamin A in the medication of pulmonary TB patients had some influence on the acceleration of sputum conversion at the intensive phase in the Medan Kota.

Introduction

Indonesia is in the second rank for the highest Tuberculosis (TB) cases in the world after India. It is estimated that there are 1 million new cases per year in Indonesia, twice more than the previous incidence forecast compared to that of in 2014 (WHO, 2015) [1].

It was reported in 2015 that North Sumatera Province was the province with the fourth-highest rate of New TB cases after West Java, East Java and Central Java. New cases of pulmonary TB patients (BTA) (+) who received medication in North Sumatera reached up to 16,946 people, with successful medication for 15.774 people (93.1%) (Kemenkes RI, 2016) [2].

According to the report on pulmonary TB in the last three years issued by the Health Agency of Medan, there were 1,586 BTA (+) cases in 2013 which were mostly contributed by Medan Kota Subdistrict with 200 patients; there were 1,650 BTA (+) cases in 2014 which were mostly contributed by

Medan Kota Subdistrict with 220 patients, and there were 1,576 BTA (+) cases which were mostly found in the working area of Medan Kota Subdistrict Puskesmas with 197 patients.

The results of the research by Pakkasi et al., in Indonesia in 2010 demonstrated that the group of patients who were supplemented vitamin A had an average of sputum conversion acceleration at 2.1 weeks, while the group of patients who were supplemented had an average of sputum conversion acceleration at 2.5 weeks [4].

One of the indicators used to monitor the medication of pulmonary TB is the conversion rate. Conversion Rate is the percentages of newly diagnosed pulmonary TB patients who are confirmed to bacteriology change into negative BTA (Acid Fast Bacteria) after going through preliminary medication period (Ministry of Health of Republic of Indonesia, 2014) [5].

Based on the above-explained background, the researcher is interested in studying the influence of vitamin A supplementation in the medication of pulmonary TB patients on the acceleration of sputum conversion at an intensive phase in the working is of Medan Kota sub-district.

Methods

Clinical testing research type is employed with an experimental approach and Quasi Experiment method. The research was done from May until October 2017 in the working are of Medan Kota Subdistrict Puskesmas.

This research took thirty (30) patients fulfilling inclusive criteria such as ≥ 18 years old, male and female, diagnosed by pulmonary TB with BTA (+) sputum, and medication using category I OAT, never had OAT medication before, willing to regularly take Category I OAT medicine during this research, and suffering from TB with BMI ≥ 18.5.

The data analysis was done using computerisation applying the software of SPSS 21. Mann Whitney testing was employed for the data analysis at a reliability rate of 95% and considered significant at $p < 0.05$.

Results

Age

The treatment group demonstrated that the findings were mostly 18-27 years old, i.e., 6 patients (40.0%) and those of the control group were also mostly 18-27 years old i.e. 5 patients (33.3%).

Sex

The findings in the treatment group were mostly male i.e. 11 patients (73.3%), and those of the control group were mostly male i.e. 12 patients (80.0%).

Occupation

The findings in the treatment group were mostly university students i.e. 4 patients (26.7%). The findings in the control group were mostly university students and entrepreneurs i.e. 3 patients each (20.0%).

BTA Examination and Mean Conversion

The BTA examination on the patients in the treatment group showed that most of their BTA were 3+ i.e. 9 patients (60.0%) with mean of conversion 2.7 weeks.

The BTA examination on the patients in the treatment group showed that most of their BTA were 3+ i.e. 9 patients (60.0%) with mean of conversion 4.4 weeks.

Patients' BMI (Body Mass Index)

Majority of the patients in the treatment group demonstrated an increase in the average of BMI resulted from comparing BMI from before medication and after conversion; the mean of BMI before the medication was 21.39, and the mean of BMI after conversion treatment was 21.62 and the increase was 0.23. The highest increase was demonstrated by respondent number 13 i.e. 0.67. The average of BMI resulted from comparing BMI from before medication and after conversion showed an increase; the mean of BMI before the medication was 21.75, the mean of BMI after conversion was 22.26 and the increase was 0.51. The highest increase in BMI was demonstrated by respondent number 4, namely 0.87.

BTA Conversion and Mean of Conversion

The treatment group demonstrated that most of patients' BTA conversion result was obtained in the second week i.e. 12 patients (80.0%) with mean of conversion 2.4 weeks. The control group demonstrated that most of patients' BTA conversion result was obtained in the fourth week i.e. 12 patients (80.0%) with mean of conversion 4.1 weeks.

Bivariate analysis

The results of the bivariate analysis using the Mann-Whitney test obtained a probability value of < 0.001 below the alpha value of 0.05. The meaning that, there was an effect of vitamin A supplementation on the treatment of pulmonary TB patients in accelerating sputum conversion in the intensive phase in the Medan Kota District Health Center Work Areas.

Discussions

The results of the research showed that most of the patients in the treatment group and control group were 18-27 years old i.e. 6 patients (40.0%) and 5 patients (33.3%) respectively. According to the report of the Minister of the Republic of Indonesia (2012) stated that approximately 75% of TB patients were from the most productive age group economically (15-50 years old). It is discovered that people in productive age are vulnerable to be infected by Pulmonary TB, as they have high mobility and frequently interact with other people around them. WHO (2013) [3] reported that 75% of all TB cases were found in the age group of 15-54 years old.

The results of the research on the treatment group also showed that most of the patients were male i.e. 11 patients (73.3%) and female i.e. 4 patients (26.7%), while those of the control group were mostly male i.e. 12 patients (80.0%) and females i.e. 3 patients (20.0%). It is in line with the report issued by WHO (2015) [1] stating that approximately 9.6 million of pulmonary TB cases consisting of more males (56.2%) than females (33.3%) so 3.2 million cases were found in females. Females contributed 480,000 cases out of 1.5 million of deaths caused by TB. The results of this research are in line with the report issued by the Minister of Health of the Republic of Indonesia (2013) stating that the prevalence of pulmonary TB is higher in males than in females (0.4: 0.3) [5]. It was found out that the males as the head of families and the financial supporter have more activities outside the house so that they are more vulnerable to be infected by pulmonary TB. As observed from sex, the number of treatments in males is 1.5 times higher than in the females.

As observed from occupation, the whole research subjects were dominated by university students i.e. 7 patients (23.3%). Four patients (26.7%) were from the treatment group and 3 patients (20.0%) from the control group. These results are in line with what was reported by the Minister of Health of the Republic of Indonesia (2013) that the prevalence of TB was mostly contributed by patients who did not work (11.7). An adult TB patient would lose 3 to 4 months of his working time on average that reduced 20-30% of his family income.

As observed from the BTA examination classifying into a group of 1+, 2+, 3+. The treatment group was dominated by +3 i.e. 9 patients (60.0%) with mean of conversion period of 2.7 weeks; the control group was dominated by 3+ i.e. 9 patients (60.0%) with mean of conversion period of 4.4 weeks. It is discovered that either the treatment or control group was dominated by pulmonary TB with BTA 3+. These results are following the research done by Tsani (2011) [6] stating that the results of BTA examination on 140 pulmonary TB patients showed that most of them (95 patients) had BTA 3+.

The results of the research on the treatment group (Vitamin A supplementation) demonstrated that the BTA conversion mostly took place in the second week i.e. 12 patients (80.0%), while that of the control group (without Vitamin A supplementation) mostly took place in the fourth week i.e. 12 patients (80.0%). The mean of conversion period obtained in the treatment and control groups were was 2.4 weeks and 4.1 weeks, respectively. These results were in line with the research done by Pakkasi et al. in Indonesia in 2010, stating that the patients supplemented by vitamin A had sputum conversion acceleration at 2.1 weeks in average [5]. These results were in line with the research done by Ahmad et al., [7] in India in 2012 stating that vitamin A supplementation best-accelerated sputum conversion i.e. 4.3 weeks. This research proves that pulmonary TB patients who have medicated with category I OAT and supplemented by vitamin A have BTA conversion earlier than those who are only medicated with category I OAT and not supplemented by vitamin A.

The statistical results using Mann-Whitney method obtained $p < 0.001$ which was still below the significance rate of alpha 0.05; which indicated that vitamin A supplementation had some influence on the acceleration of sputum conversion period at an intensive phase in the working are of Medan Kota Subdistrict Puskesmas. The earlier BTA conversion is, the faster the patients' recovery and the less the infection will be. This research is in line with the research done by Pakkasi in 2009, stating that there was a correlation between the low intake of vitamin A and the severity of TB with $P = 0.000$. The research was done by Karyadi et al., (2002) [8] discovered that vitamin A and zinc supplementation repaired the therapeutical effect of TB after 2 months.

There is an obvious causal correlation between two-malnutrition and active TB; nutrition assessment and management are integrated with medication and treatment of TB (WHO, 2013) [3]. TB reduces nutrition, and nutritional sufficiency weakens bodily immunity so that it increases the possibility of activating latent TB. Most individuals are catabolic and lose weight; some of them indicate malnutrition and mineral when being diagnosed. Weight loss in TP patients can be caused by some factors such as reducing food intake due to the declining appetite, nausea and stomachache, nutrition loss due to vomit

and diarrhoea. The low BMI (Bodily Mass Index), which is lower than 18.5 kg/m^2 is related to the increase if death risk, relapse and severity of TB. An effective TB therapy will repair nutritional status by improving patients' appetite and increasing metabolism efficiency (WHO, 2013) [3].

BMI below 18.5 increases 2-3 times higher risk of TB. Otherwise, weight gain will reduce this risk. BMI in average increases in cured patients by the end of the medication compared to the patients who are not cured by the same time (Nagpal et al., 2014) [9].

In conclusion, the mean of sputum conversion period in pulmonary TB patients who are ≥ 18 years old, medicated with category I OAT, BMI ≥ 18.5 in the group whose members are supplemented with vitamin A 6000IU + category I OAT is 2.4 weeks, whereas that of the group whose members are only medicated with category I OAT is 4.1 weeks. Vitamin A supplementation in the medication of pulmonary TB patients who are ≥ 18 years old, medicated with category I OAT and BMI ≥ 18.5 has an influence on the acceleration of sputum conversion at an intensive phase in the working area of Medan Kota Subdistrict Puskesmas.

Pulmonary TB patients who were ≥ 18 Tahun, medicated with category I OAT, whose BMI was ≥ 18.5 were mostly 18-27 years old, male, university students, whose BTA were 3+, in the treatment group had conversion in the second week and the control group had conversion in the fourth week.

References

1. WHO, 2015. Global Tuberculosis Report. Geneva, Switzerland, 2015.

2. Kemenkes RI. Pusat data dan Informasi. Tuberkulosis, Temukan, Obati sampai sembuh. Jakarta, 2015.

3. WHO. Guideline: Nutritional Care and Support for Patients with Tuberculosis. Geneva, 2013.

4. Pakasi, Trevino A, Elvina, Karyadi, Yulianti W, Yogy Simanjuntak, Ni Made DS, Michael S, Nining D, Jos WM van der Meer, Koos van der Velden, Wil MV Dolmans. Vitamin A deficiency and other factors associated with severe tuberculosis in Timor and Rote Islands, East Nusa Tenggara Province, Indonesia chapter 3 PDF hosted at the Radboud Repository of the Radboud University Nijmegen, 2009. https://doi.org/10.1038/ejcn.2009.25 PMid:19471295

5. Pakasi, Trevino A, Elvina Karyadi, Ni Made Desy Suratih, Michael Salean, Nining Darmawidjaja, Hans Bor, Koos van der Velden, Wil MV Dolmans, Jos WM van der Meer. Zinc and Vitamin A supplementation fails to reduce sputum conversion time in severely malnourished pulmonary tuberculosis patients in Indonesia, 2010. https://doi.org/10.1186/1475-2891-9-41 PMid:20920186 PMCid:PMC2957385

6. Tsani RM. Gambaran Klinis Tuberkulosis Paru di RSUP Dr Kariadi Semarang Periode Januari-Juni 2011. Jurnal Kedokteran Muhammadiyah. 2012;1(2).

7. Ahmad I, Kushwaha R, Kant S, Natu SM, Singh SK, Usman K, Ali W, Katiar DK, Saleem M. Role of Vitamin A and Zink Supplementation on sputum conversion time in pulmonary Tuberculosis patients. JRAAS. Erstwhile King George's Medical University Dinas Kesehatan Kota Medan, 2015. Laporan Kasus TB Paru 2013-2015, 2012.

8. Karyadi E, West CE, Schultink W, Nelwan RH, Gross R, Amin Z, Dolmans WM, Schlebusch H, Van Der Meer JW. A double-blind, placebo-controlled study of vitamin A and zinc supplementation in persons with tuberculosis in Indonesia: effects on clinical response and nutritional status. The American journal of clinical nutrition. 2002; 75(4):720-7. https://doi.org/10.1093/ajcn/75.4.720 PMid:11916759

9. Nagpal M, Priyanka Devgun NC. A study on nutritional status and change in body mass index with treatment outcome in smear-positive pulmonary TB patients on DOTS in Amritsar city. Int J Med Sci Public Heal. 2015; 4:454-7. https://doi.org/10.5455/ijmsph.2015.1611201493