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Research Article

Association of Malnutrition With The Prevalence of Tuberculosis (TB) in Married Women

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Abstract

Background: Tuberculosis (TB) is one of the most life threatening diseases which causes more deaths than any other diseases caused by microbial agents. Every year, additionally 13.7 million infected by TB and more than 1.5 million people die of tuberculosis. Relationship between TB & malnutrition is two-way, tuberculosis takes patient to malnutrition & malnutrition raises the danger of growing active TB by 6 to 10 times. Refining the food of a person significantly decreases TB. Aim of the current study was to evaluate nutritional importance and factors of malnourished subjects amongs TB patients.

Methods: Cross-sectional study was executed. 202 female TB patients and those who were on concentrated phase treatment were selected prospectively. A structured questionnaire was used to collect health, lifestyle, socio-economical status, dietary information & hematological profile of the selected TB patients. Clinical information was collected from medical records. Nutritional status was measured as body mass index (BMI) (weight and height) and Complete Blood Count (CBC) with peripheral smear was performed to check anemia using standard techniques.

Result: Nutritional status was measured by BMI and categorized as underweight and normal and considered as the primary outcome of the study. Eighty-two (40.6%) TB patients were malnourished (BMI <18) and eighty- nine (44.1%) patients had BMI >18.5 kg/m^2 and other 31 (15.3%) patients had BMI (25.5 - 29.9 kg/m^2). 75% of patients showed microcytic type of cells in peripherial smears and 25% patients showed macrocytic type of cells under light microscope, represented iron deficiency anemia and megaloblastic anemia respectively. The overall occurrence of malnourished among tuberculosis patients was 40.6%.

Conclusion: A great number of TB patients was malnourished. Tuberculosis patients were tremendously vulnerable to malnutrition and even a very far issue for malnutrition turns into immediate for TB patients.

Keywords: *Tuberculosis, Malnutrition, Anemia, Body Mass Index.*

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INTRODUCTION

Tuberculosis (TB) is a serious infectious disease that attacks the lungs but may infect other parts of the body as well . When mycobacterium hits in lungs is known as Pulmonary Tuberculosis and when mycobacterium attacks the other parts of the body is known as Extra Pulmonary Tuberculosis (1). Pulmonary TB has become an international problem. Six countries accounted for 60% of the new cases of TB i.e. India, Indonesia, China, Nigeria, Pakistan, and South Africa (2). According to the WHO more than 1/4 of the world population has been affected by TB disease. TB has re-emerged as a serious public health threat worldwide. About 8.6 million new cases of TB and more than 1.3 million deaths has been reported (1). When BMI of an adult marks lesser than 18.5 kg/m^2 is termed as underweight (3, 4). It outcomes because of a divergence between body and food supply. Situations alike metabolism disorders, eating disorders, genetics, adverse effects of medicine and TB (5, 6). TB remains a leading cause of morbidity and mortality in developing countries (7). Under nutrition and TB have a bidirectional relationship, under nutrition, and weak immunity can result in the disease and infection can worsen the nutritional status. Under nutrition among TB patients leads to worse treatment outcomes (8). Severe under nutrition at diagnosis has been shown to be associated with a two-fold increased risk of death. Therefore, under nutrition needs to be treated (9). In Africa countries malnourishment was 29% to 61% in tuberculosis patients (10). In Asia undernourishment ranged among TB patients from 68.6% to 87% (11). Incidence of malnutrition in South America contents ranged 20% to 50% (12) and BMI in the UK was 13% poorer compared to general community in TB patients (13). Anemia is common in patients with TB and appears to be more regular among TB/HIV-co infected patients (14). Predictable reasons for this contain increased blood loss from haemoptysis (blood in sputum for tuberculosis patients), bone marrow involvement (decreased red blood cell production), poor appetite and food intake resulting in poor micronutrient status(14, 15). Other factors like innate immunity or the deficiencies in cell mediated immunity are responsible for causing the disease many hematological distortions like Hodgkin's disease, chronic myelogenous leukemia and multiple myeloma are linked directly and indirectly with the TB (16). Balochistan covers 44% of the country's total area and is the largest province of Pakistan. Mostly the population of the Baluchistan is dispersed into the remote areas. Directly observed treatment programme was planned in 2012 roughly 20000 new cases of the TB were noted. Current study produces baseline evidence to spring main concern for nutritional engrossment as a fragment of tuberculosis handling. We have conducted a hospital-based study for assessment of

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factors associated with patients of TB and nutritional status in Fatima Jinnah Chest and General Hospital Quetta, Balochistan, Pakistan.

METHODOLOGY OF THE STUDY

A hospital-based study was conducted At Fatima Jinnah Chest and General Hospital Quetta, Balochistan. The hospital provides inpatient and outpatient services to the population in the surrounding as well as other districts of the province. The hospital has Directly Observed Treatment Short Course (DOTS) clinic where TB patients are given DOTS. Approximately 90 –100 cases of TB patients are registered per month. Sample size for the current study was 202 TB patients. The patients selected for the study were grouped into categories according to the age. Two sputum samples were received from each patient, one before breakfast and second after breakfast. The patients were advised to cough deeply into a sterile container at the good atmosphere and keep away from the people. Then samples were immediately registered and labeled with the lab no, name, age, gender respectively & then stored in a dry and cool place. A well cleaned new slide (free from grease) was labeled with patient's lab number using a sterile wire loop. These samples were smeared on a glass slide and then stained using Ziel Nelson stain (ZN stain) and later examined the smears under microscope using 100x objectives. For hematological analysis about 4-5ml peripheral venous blood was drawn aseptically with the help of sterile syringe. The WBCs, RBCs & platelets were measured by direct current (DC) detection method. Hemoglobin was measured by SLS-Hb (sodiumlauryl Sulfate – hemoglobin) method.

Anthropometric measurements for calculating BMI used to determine the nutritional status of the patients. Body mass index was calculated by weight for height defined as the weight in kilograms of the individual divided by the square of the height in meters. The standard protocol suggested by the World Health Organization 2006 was followed to conduct and interpret anthropometric assessment.

Obtained data were put in computer for analysis using Epi-info software and later transferred into SPSS and world health organization anthrop us software. Descriptive statistics used for recognizing of percentage of malnutrition. Binary logistic regression was used to recognize factor of malnutrition. Nutritional status was assessed by BMI. Body mass index less than 18.5 kg/m^2 was considered underweight (3).

RESULTS AND DISCUSSION

The minimum age of all enrolled female TB patients was 17 years and maximum age was 85 years (mean age was 40.03±17.93). The TB patients belong to the urban areas were 49.5% and remaining 50.4% were from rural areas of Balochistan. Minimum weight was 30kg and maximum weight was 98kg (mean weight was 49.6kg ± 11.35). The minimum height in meters was 1.07 and maximum was 1.83, the mean height was 1.47±0.14. Minimum Body Mass Index was 10.4, maximum was 45.7 and mean BMI was 23.4± 6.8 (Table.1).The patients included in the study were belonged to following major ethnic groups i.e. Balochi 15.3% (31), Pashtoon 57.4% (116), Panjabi 2.5% (05), Brahvi 16.8% (34) and Others (Sariki, Sindhi, Hindko etc.) 7.9% (16). In the previous history of the patients regarding infectious diseases such as COPD (11.9%), asthma (5.0%), post TB (41.10%) & no infection (42.2%) (Table 4).

Haemoglobin status (Hb) was observed, in which minimum Hb was 7.3 g/dl and maximum was 14.4 g/dl, mean value was 11.8±1.5. Platelet count estimated, the minimum count was $49.0x10^3$/ul and maximum count was $694x10^3$/ul and average count was $289x10^3$/ul± 102.5. Mean Platelet volume noted in which minimum count was 5.8 FL maximum was 12.2 FL, average count was 8.2 FL and ±SD was 1.4. Mean cell volume of studied patients showed minimum 42.0 FL, maximum was 102.50 FL, average volume was 72.6 FL ± 11.5.Mean Corpuscular Hemoglobin concentration was 32/dl, minimum value was 24.4/dl, maximum was 38.5/dl± 2.0. Mean corpuscular Hemoglobin in 202 Patients (Table 2). According to World Health Organization recommendation for anemia, concentration of hemoglobin less than 12.5g/dl in women in that order was used in the current stud (17). 75% of patients showed microcytic type of cells in peripherial smears and 25% samples showed macrocytic type of cells under light microscope, represented Iron Deficiency Anemia and Megaloblastic Anemia respectively. Megaloblastic anemia occurs due to deficiency of folate and vitamin B12. Both are essential for formation of DNA of RBCs, so defective RBCs form with prominent nuclei. As a result abnormal sized RBCs with nuclei circulate in body as compared to normal RBCs that lack nuclei. These large sized RBCs are more vulnurable to rupture in spleen so decreased number of RBCs as well as defective cells lead to decreased affiliation of O2 with Hb. Iron deficiency anemia, as the name indicates, occurs due to deficiency of iron. Iron is an integral part of structure of Haemoglobin (Hb). Hb is present in RBCs, necessary for O2 transport from lungs to tissues. Due to deficiency of iron, Hb structure disrupt, leads to decreased O2 binding capacity, anemia develops. Anemia was typed based on the MCV, MCH and peripheral smear findings, in another study Anemia was seen in 74% of TB patients (18). Other authors have also reported a blunted erythropoietin response to anemia of untreated TB. The odds of malnutrition have been increased by anemia by 3.23 folds higher in TB patients whose age was greater than 25 years. Moreover, anemic TB patients show a distinctive inflammatory profile, which is only to some extent, regressed at 60th day of antitubercular treatment. It is postulated that the tumor necrosis factor–α (TNF- α) and other cytokines released through activated monocytes repress the erythropoietin production leading to anemia (19). Another study also reported the elevated serum ferritin level in all TB patients (20).

The results of analysis done by Association of Dietary Status of TB patients with socio demographic, living style and health factors, showed that the patients consuming tobacco, had difficulty in breathing while other substances were possibly involved to lower the BMI. Due to the lower appetite, most of the TB patients were reported consuming of two meals in a day. Other studies revealed that the meal frequency increased the risk of low BMI (21). The malnutrition was higher in the women TB patients (22), on account of this cause, the danger of tuberculosis was greatly active in women (23). Undernourishment was higher in anemic patients of TB as compare to non-anemic tuberculosis sufferers (24). It is due to the result of RBCs in the carrying of minerals & nutrients (25). Believe in avoiding a specific kind of foods elevate the odds of malnutrition, this study was done in Ghana (26). It is because of the reason that sufferers do not take significant nutrients because of their nature for dodging such food (27).The patients who use the alcohol had higher risk of malnutrition than nonalcoholic TB patients (28), due to that patients with alcoholic habit eat unwell, low storage, have low digestion storing, use and evacuation of nutrients (29). Poor nutrition among patients who have undergone gastrectomy may be a threat for the reactivation of TB. There are other studies indicating that occurrence of TB is unusually elevated among malnourished community (30).

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Table 1. Physical status of patients

	Minimum	Maximum	± Mean	± SDM
Age (Year)	17.00	85.00	40.03	17.93
Weight (Kg)	30.00	98.00	49.61	11.35
Height (meter)	1.07	1.83	1.47	0.142
BMI (kg/m^2)	10.46	45.78	23.43	6.85

*All values were taken in triplicate of mean ± standard deviation (± SDM).

Table 1 shows the physical status of all TB patients enrolled in the study. Minimum age was 17 years and maximum age was 85 years, while the mean age was 40± 17.93. Minimum weight was 30 kg and maximum weight was 98 Kg, mean weight was 49.6 kg ±11.35. The Height wise minimum height in meters was 1.47 and maximum was 1.83.

The mean height was 1.47 ± 0.14. Minimum Body Mass Index was 10.4, maximum was 45.7, and mean was 23.4 ± 6.8. Table 2 shows hematological profile of the TB patient at the time of registration. Out of 202 patients, the White Blood Cells (WBC) count noted, in which minimum 2.4 $x10^3$/ul and maximum 96.0$x10^3$/ul and mean white blood cells count was 8.4$x10^3$/ul±6.8. Red Blood Cells count was also registered in which minimum count was

Table 2. Hematological profile of TB patient at the time of registration.

Variables	Unit	Min	Max	Mean	Std. Dev
WBC	10^3/ul	2.40	96.00	8.4451	6.83556
RBC	10^6/ul	2.72	9.40	5.0770	1.08506
PCV	%	17.67	104.00	38.0922	7.78800
HB	g/dl	7.30	14.40	11.8966	1.50529
Platelets	10^3/ul	49.00	694.00	289.4213	102.583
MPV	Fl	5.80	12.20	8.2792	1.48591
MCV	Fl	42.00	102.50	72.6644	11.55582
MCHC	g/dl	24.40	38.50	32.1450	2.09949
MCH	Pg	18.0	32.40	25.0338	3.56026

*All values were taken in triplicate of mean ± standard deviation.

2.72$x10^6$/ul and maximum count was 9.4$x10^6$/ul and average 5.0$x10^6$/ul±1.8. Packed cell volume (PCV) was also noted in these 202 patients PCV 17.6 % was minimum and maximum was 104%, the mean was 38.0 %±7.7. Haemoglobin (HB) status was also notified of the patients in which minimum HB was 7.3 g/dl and maximum was 14.4 g/dl whereas mean value was 11.8±1.5. Platelet count was also notified, the minimum count was 49.0$x10^3$/ul, maximum count was 694$x10^3$/ul and average was 289$x10^3$/ul±102. Mean Platelet Volume (MPV) of the patients was noted, in which minimum count was 5.8 FL, maximum was 12.2 FL and average count was 8.2 FL ±1.4.

The minimum Mean Cell Volume of (MCV) of the patients was 42.0 FL, maximum was 102.50 FL and average was 72.6 FL ±11.5. Mean Corpuscular Hemoglobin Concentration (MCHC) of the patients was 32/dl, minimum value was 24.4/dl and maximum was 38.5/dl±2.0. Mean Corpuscular Hemoglobin (MCH) of all 202 patients was noted; minimum figure was 18.0 Pg, maximum was 32.4 Pg and average value was 25.0 Pg±3.5.

Table 3. BMI profile of tuberculosis patients

Body Mass Index (BMI)		
Description	**Frequency**	**Percent**
Underweight	82	40.6%
Normal weight	89	44.1%
Pre obesity 25.0–29.9 (kg/m^2)	31	15.3%

Table 4. General profile of tuberculosis patients

Population profile		Frequency (no)	(%)
1	**Sex**		
	Female	202	100
2	**Residency**		
	Urban	100	49.5
	Rural	102	50.4
3	**Social economic status**		
	Very Poor	46	22.8
	Poor	74	36.6
	Middle Class	80	39.6
	Rich	02	1.0
4	**Languages**		
	Balochi	31	15.3
	Pashtu	116	57.4
	Panjabi	05	2.5
	Brahvi	34	16.8
	Others	16	7.9
5	**Pervious History**		
	Post TB	83	41.10
	No	85	42.2
	COPD	24	11.9
	Asthma	10	5.0
6	**TB Screening**		
	Positive	202	100
7	**HCV**		
	Negative	195	96.5
	Positive	07	3.5
8	**HBV**		
	Negative	190	94.1
	Positive	12	5.9
9	**Diet**		
	Vegetable	43	21.3
	Meat	40	19.8
	Fruit	02	1.0
	Other Sources	117	57.9
10	**Drinking water source**		
	Tube Well	168	83.2
	Government Water Supply	23	11.04
	Others Sources	11	5.4
11	**Recovery of patients**		
	Yes	168	83.2
	No	34	16.8

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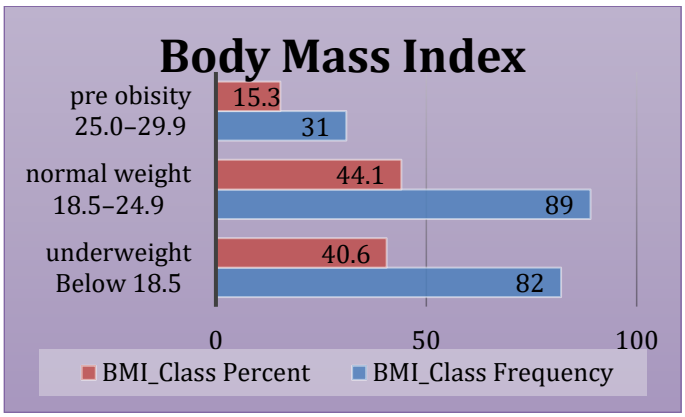

Fig. 1. BMI of tuberculosis patients

In the present study, 40.6% patients were underweight, 44.1% having normal weight and 15.3% patients were fall in pre-obesity class according to the standard BMI calculations (Table 3, Fig. 1). Table 4 shows the general profile of TB patients which includes sex, residency, socio economic status, language, previous illness history, TB screening, HBV and HCV history, diet, drinking water source and recovery of the patients. From all study subjects, 49.5% were urban area residents and 50.4% were rural area residents. The socioeconomic status of these subjects was also registered in which 22.8% were very poor, 36.6% were poor, 39.6% were middle class and 1% were rich. 15.3% were baloch, 57.4% were pashtoon, 2.5% were punjabi,16.8% were brahvi and rest of the subjetcs were 7.9%. There previous history of illness of all study subjects was also noted, in which post TB cases were 41.1%, without any previous history of TB were 42.2%, COPD were 11.9%, asthama 5.0%. The hepatitis B and C status was also included in the study. Out of which, 96.5% subjects were negative for HCV and 3.5% were positive. 94.1% were negative for hepatitis B viral infection and 5.9% were positive. Diet history of study subjects was also recoded, in which 21.3% were vegetarian, 19.8% were non vegetarian, 10% patients were using fruits and 57.9 % patients were using other sources. Drinking water source was also noted, in which 83.2% were consuming tube well water, 11.0% were consuming government water supply and 5.4% were consuming other sources of water.

CONCLUSION

Based-on the current study findings community based intervention should be developed & execute throughout the region to get better the malnurished TB patients. Prevalence an extremely high proportion of the patients of tuberculosis were greatly at risk of the malnourishment and even a very far issue for malnutrition turns into immediate for TB patients. Iron deficiency is a main factor associated with malnurished TB patients followed by BMI. It is suggested that the prescribers should focus on their involvement to advise iron rich diet or balanced feed suppliments to the tuberculosis patients. Furthermore, the dietry habits, living standards, socioeconomic status and area of living also have an positive correlation with malnurishment of female TB patients.

REFERENCES

1. National Center for HIV/AIDS, Viral Hepatitis, STD, and TB Prevention (2014).
2. World Health Organization. Global Tuberculosis Report. Geneva World Health Organization; 2016
3. NHANES: Anthropometric procedure manuals vol. United state of America national health and nutritional examination survey; 2007.
4. WHO. nutritional landscape information system. Geneva: World Health Organization; 2010. p. 1– 51.
5. Bernstein M, Munoz N. Nutrition for the older adult: Jones & Bartlett Learning; 2019
6. Kumar R, Abbas F, Mahmood T, Somrongthong R. Prevalence and factors associated with underweight children: a population-based sub national analysis from Pakistan. BMJ Open. 2019;9(7):e0289
7. Zaman K. Tuberculosis: A global health problem. J Health Population Nutrition 2010;28:111-3.
8. Padmapriyadarsini C, Shobana M, Lakshmi M, Beena T, Swaminathan S. Under nutrition and tuberculosis in India: Situation analysis and the way forward. Indian J Med Res 2016;144:11-20.
9. Semba RD, Darnton-Hill I, de Pee S. Addressing tuberculosis in the context of malnutrition and HIV co infection. Food Nutr Bull 2010;31:S345-64.
10. VanLettow M, Kumwenda J, Harries A, Whalen C, Taha T, Kumwenda N, Kang' ombe C, Semba R. Malnutrition and the severity of lung disease inadults with pulmonary tuberculosis in Malawi. Int J Tuberc Lung Dis. 2003;8(2):211– 7.
11. Pakasi T, Karyadi E, Dolmans W, vanderMeer J, vanderVelden K. Malnutrition and socio-demographic factors associated with pulmonary tuberculosis in Timor and Rote Islands, Indonesia. IntJTuberc Lung Dis. 2009;13(6):755 – 9.
12. Silvana P, Maria C, Florisneide B, Susan P. Prevalence of nutritional deficiency in patients with pulmonary tuberculosis. J Bras Pneumol. 2013;39(4):476– 83.
13. Onwubalili J. Malnutrition among tuberculosis patients in Harrow, England. Eur J ClinNutr. 1988;42(4):363–6.
14. Karyadi E, Schultink W, Nelwan RH, Gross R, Amin Z, Dolmans WM, et al. Poor micronutrient status of active pulmonary tuberculosis patients in Indonesia. J Nutr 2000;130:2953-8.
15. Karyadi E, West CE, Schultink W, Nelwan RH, Gross R, Amin Z, et al. 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. Am J ClinNutr 2002;75:720-7.
16. Kaufmann. S. H. (2011), How can immunology contribute to the control of tuberculosis ?Nature Reviews Immunology , 1(1),20.
17. Lee SW, Kang YA, Yoon YS, Um SW, Lee SM: The prevalence and evolution of anemia associate with tuberculosis. J Korean Med Sci 2006;21:1028-32.
18. Yaranal PJ, Umashankar T, Harish SG. Hematological Profile in Pulmonary Tuberculosis. IntJ Health Rehabil Sci. 2013;2(1): 50-55.
19. Singh KJ, Ahulwalia G. Sharma SK, Saxena R, Chaudhary VP, Anant M. Significance of hematological manifestations in patients with tuberculosis, J Asso Physicians Ind 2001; 49:788-94.
20. Morris CD, Bird AR, Nell H, the hematological and biochemical changes in severe pulmonary tuberculosis. Q J Med. 1989;73:1151-9.
21. Nthiga I, Mbithe D, Mugendi BJ, Wambui T. The nutritional status of pulmonary tuberculosis patients aged 25-44 years attending uberculosis clinic at Lodwar county and referral hospital, Turkana county, Kenya. Int J Food SciNutr 2017;2:119-22.

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22. Amit K, Rakesh K, Kandpal S, Girish S. Nutritional status in multi-drug resistance-pulmonary tuberculosis patients. Indian J Community Health.2014;26(02):204– 9.
23. Ducomble T, Tolksdorf K, Karagiannis I, Hauer B, Brodhun B, Haas W, FiebigL. The burden of extrapulmonary and meningitis tuberculosis: an investigation of national surveillance data, Germany, 2002 to 2009. 2013.
24. Lins TB, Soares Ede M, dos Santos FM, Mandacaru PM, Pina T, de Araujo Filho JA. Mycobacterium tuberculosis and human immunodeficiency virus coinfection in a tertiary care hospital in Midwestern Brazil. Le infezioniinmedicina. 2012;20(2):108– 16
25. Epstein E. Mineral nutrition of plants: mechanisms of uptake and transport. Annu Rev Plant Physiol. 1956;7(1):1 – 24.
26. DodorEss. Evaluation of nutritional status of new tuberculosis patients at the effia-nkwanta regional hospital. Ghana Med J. 2008;42(1):22 – 8.
27. Sutliffe JT, Fuhrman JH, Carnot MJ, Beetham RM, Peddy MS. Nutrient-dense, plant-rich dietary intervention effective at reducing cardiovascular disease risk factors for worksites: a pilot study. AlternTher Health Med. 2016;22(5):32–6.
28. Friis H, Range N, BraendgaardKristensen C, Kaestel P, Changalucha J, Malenganisho W, Krarup H, Magnussen P, Bengaard Andersen A. Acute- phase response and iron status markers among pulmonary tuberculosis patients: across-sectional study in Mwanza, Tanzania. Br J Nutr. 2009;102(2):310–7.
29. Usha R, Sailesh KS, Divya D, MJ VK, Angel J, Mukkadan J. A study on comparison of random blood glucose levels in alcoholic and non-alcoholic males of Ernakulam district, Kerala. Asian J Health Sci. 2013;1(1).
30. Sundre P, ten Dam G, Kochi A. Tuberculosis: A global overview of the situation today. Bull World Health Organ. 1992;70:149–59.s

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