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Original Research Article

Diagnostic role of gastric aspiration in sputum negative pulmonary tuberculosis

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Abstract

Introduction: Tuberculosis is one of the deadly diseases claiming a mortality rate 2.7 million lives, emphasise the need for early diagnosis and treatment initiation. But the diagnosis of sputum negative pulmonary tuberculosis is challenging even with a procedure like bronchoscopy which demands technical expertise and monitoring. Also the problem experienced at the grass root level is collection and transportation of sputum for CB-NAAT mycobacterium detection to the lab and results generation takes more than 1 week. Hence, a diagnostic test which is more feasible even to the primary health centre has to be established. Gastric aspirate though performed among the paediatric age group, its role in diagnosis of sputum negative pulmonary tuberculosis among adult patients is taken up in our study.

Methodology: Patients above 18 years of age with pulmonary TB suspicion are tested for sputum for AFB followed by chest skiagram. Those with sputum negative and chest X-ray features suggestive of tuberculosis are included into the study. Early morning gastric aspirate with the nasogastric tube is performed. Buffered sample is processed and examined for AFB and culture testing in LJ medium.

Results: 125 patients (102 male/23 female) satisfied the inclusion criteria were divided under the following categories as a) sputum smear negative for AFB (82) b) No sputum production (26) and c) morbidly sick (17). The diagnostic yield of smear positive in gastric aspirate was 24% (31), while the gastric aspirate cultured in LJ medium found to be positive for MTB in 22% (28). Four patients were positive for post gastric aspirate sputum for AFB. Among 22 patients who underwent bronchoscopy, seven were found to be positive for AFB.

Conclusions: The positivity of AFB in smear and culture in gastric aspirate was 24% and 22% respectively. Hence gastric aspirate can be employed as a tool for diagnosis among sputum negative pulmonary tuberculosis.

Introduction

Tuberculosis is one of the most deadly infectious diseases among developing countries like India which contributes to one-fourth of the global TB burden. We also witness glaring reports of 28 lakh new case occurrence every year and 4.8 lakh deaths due to TB. An estimated 1.3 lakh incident multi-drug resistant TB cases emerge annually in India which includes 79000 MDR-TB Patients estimates among notified pulmonary case [1]. The median delay for diagnosis and treatment initiation in a rural setting was found to be 35.5 days [2]. Among patients with pulmonary tuberculosis, there is a subset of a population with atypical clinical presentation with fever, loss of weight and appetite with no sputum production. RNTCP recommends microbiological confirmation of sputum negative cases of pulmonary tuberculosis suspects by CB –NAAT. All primary health centres are only sites for sputum collection at present and it is time consuming that scheduling a specific day for collection and transportation of the sample to CB-NAAT lab takes more than 1 week due to logistic reasons. The median delay for diagnosis and treatment initiation in a rural setting was found to be 35.5 days [3]. Bronchoscopy is a technique to obtain the respiratory sample form the lower respiratory respiratory tract which require high technical expertise, bronchoscopy suite, monitoring of the patient during and after the procedure and hazardous to the bronchoscopist due to exposure to tubercle bacilli. This may delay in initiating the treatment of pulmonary tuberculosis as the TB infectiousness among smear negative pulmonary tuberculosis is around 17.3% to 22.2% [3]. Gastric aspiration is a technique which has been employed in paediatric population for suspected cases of primary complex. Our study aim is to find the diagnostic role of gastric aspirate in smear negative pulmonary tuberculosis.

Materials and Methods

Inclusion criteria

1. Adult patients with age more than 18 years
2. Radiological and clinical suspicion of active pulmonary tuberculosis
3. Sputum smear AFB (two samples) – negative
4. Those with no symptoms of sputum production.

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5. Very sick patients to submit sputum sample.

Exclusion criteria
1. Children
2. Not willing to give consent
3. Nose, mouth deformities

The study was done after obtaining clearance from institution ethical committee. All the patients with clinical features of pulmonary tuberculosis are taken with chest X-ray and sputum for AFB 2 samples. The study was conducted at the Saveetha Medical college Hospital for a period of one year.

Study subjects were classified into three groups.
1. Those who have sputum production with radio logically active lesion but sputum smear negative for AFB.
2. Those patients who have neurological deficits (meningitis/CVA) and very sick, who cannot bring out sputum.
3. Those who have a radiological significant lesion without sputum production.

After obtaining informed consent from the patient, the patient is asked to be on overnight fasting at least for 8 hrs from previous day night. A nasogastric tube of appropriate size is taken and lubricated with lignocaine gel (10%). A nasogastric tube is introduced and as soon as tube reached the gaster, position confirmed and at least 15-20 ml of gastric aspirate fluid collected in a sterile container without adding any fluid to it. If the patient feels uncomfortable anytime, NG tube is withdrawn.

The transit time from sample collection to lab should not be more than 10 minutes. After obtaining the sample, 4% NaOH is added to it and allowed to rest for at least 10 min. The idea of adding NaOH is that it will destroy the bacteria other than mycobacterium, helps to buffer the acidity of a gastric aspirate and to homogenise the sample.

Centrifugation is done at the rate of 3,000 rpm/min for at least 5 minutes. After centrifugation supernatant is discarded and equal volume of normal saline is added to the sediment. Again the sample is subjected to centrifugation at the rate of 3,000 rpm/min for 5 minutes. Similarly, the supernatant is discarded and sediment is taken. The sediment is then taken for preparation of the smear. At least two slides are prepared for each sample and examined under fluorescent microscope for acid-fast bacilli. A part of sediment is taken for culture inoculation also. For each sample, 2 tubes are used for inoculation. The conventional media used in our lab is Lowenstein Jensen medium which is egg based enriched medium. The inoculum is incubated in LJ slant culture at 37deg C for a period of at least 4-8 weeks. Reading is taken every week. Most of the time colonies appear during the 3rd-4th week. The contaminated sample with other bacteria most often showed varied growth and spoil the media and those samples are discarded. The sample is considered to have no growth after a wait period of at least 8 weeks discarded. The culture positive specimens are those which grow colonies showing irregular raised dry, wrinkled colonies which are initially white to start with later appear with a buff colour. Patients were also given a chance to undergo bronchoscopy. Based on the acceptance, patients were subjected for bronchoscopy and wash specimen were examined for AFB.

Type of the Study
Descriptive analytical study

Results

In our study, 138 patients were selected based on eligibility criteria. During the procedure there were drop outs. After obtaining the sample, some of the specimens were contaminated and discarded. Ultimately we arrived at 125 subjects.

The categorisation of smear negative cases with clinical and radiological suspicion of pulmonary tuberculosis was made as follows.
1. Sputum smear negative after submitting 2 samples for AFB (82 patients)
2. No complaints of sputum production (26 patients)
3. Morbidly sick (17 patients)

In this study about 125 patients participated where 102(81%) were males and 23(18%) were females.

Table 1: Shows gastric culture positivity among various age group of population

			Gastric culture		Total
			Positive	Negative	
Age group	**<25yrs**	Count	5	2	7
		% within age group	71.4%	28.6%	100.0%
	25-34	Count	6	18	24
		% within age group	25.0%	75.0%	100.0%
	35-44	Count	6	32	38
		% within age group	15.8%	84.2%	100.0%
	45-54	Count	8	20	28
		% within age group	28.6%	71.4%	100.0%
	>=55yrs	Count	3	25	28
		% within age group	10.7%	89.3%	100.0%
Total		Count	28	97	125
		% within age group	22.4%	77.6%	100.0%
Pearson Chi-Square			13.542[a]	4	.009

From the Table 1 it seen that middle age group falling between class intervals 35-44 age groups participated more among the various proportions. This may confirm the fact that tuberculosis is to be suspected more commonly among working class population. It is evident from the study that there is a diagnostic yield of 22.4% overall from 125 patients which are confirmed by culture alone for which the P value is significant. (p value-0.009)

Table 2: Showing gastric smear positivity among various study group

	Study groups		**Gastric smear for AFB**		**Total**
			Positive	**Negative**	
types	Smear negative	Count	16	66	82
		% within types	19.5%	80.5%	100.0%
	Moribundly sick with neurological deficit	Count	3	14	17
		% within types	17.6%	82.4%	100.0%
	No_c/o_sputum_ production		12	14	26
		% within types	46.2%	53.8%	100.0%
Total		Count	31	94	125
		% within types	24.8%	75.2%	100.0%
Pearson Chi – Square			8.053[a]	2	.018

Table 3: Shows gastric culture positivity among various categories of smear negative population

		Gastric culture positive		**Total**
		positive	**negative**	
Smear negative	Count	15	67	82
	% within types	18.3%	81.7%	100.0%
Moribundly sick with neurological deficit	Count	2	15	17
	% within types	11.8%	88.2%	100.0%
No_c/o_sputum_ production	Count	11	15	26
	% within types	42.3%	57.7%	100.0%
Total	Count	28	97	125
	% within types	22.4%	77.6%	100.0%
Pearson Chi-Square		7.830[a]	2	.020

Table 4: Cross table shows post gastric aspiration sputum for AFB

			Gastric culture		**Total**
			positive	**negative**	
Sputum for AFB after NG aspiration	Positive	Count	2	4	6
		% within Ryles_tube	33.3%	66.7%	100.0%
	Negative	Count	26	93	119
		% within Ryles_tube	21.8%	78.2%	100.0%
Total		Count	28	97	125
		% within Ryles_tube	22.4%	77.6%	100.0%
Fisher's Exact Test				.615	.405

Table 5: Shows those patients who were subjected for bronchoscopy and their yield

Patients not willing to undergo Bronchoscopy	**Positive for AFB by bronchoscopic wash**	**Negative for AFB by bronchoscopic wash**
103	7	15
Total – 125		

From the Table (2,3) compares the diagnostic yield of gastric aspirate fluid for AFB among various study groups. From this table it is inferred that among the various proportion of study group, there is statistical significance since the P value is <0.5.Even though the proportion of population was high among sputum smear negative group, percentage of positivity for AFB smear in gastric aspirate is more among those having no complaints of sputum production(46%). Among the study group, smear for AFB from gastric aspirate fluid was approximately 24% (31) while the gold standard which is gastric aspirate fluid cultured in LJ medium was 22% (28) positive. But gastric culture positivity is considered as gold standard for comparison throughout the description of results.

From the Table 4, sputum for AFB after subjecting the patients for gastric aspiration, patients were educated as

how to give the sputum for AFB. The yield of sputum for AFB was positive among six patients of which 2 patients were already proved positive in the gastric aspirate.

From the Table 5, it is seen that many of the patients who underwent gastric aspiration were not willing for bronchoscopy. 22 patients were willing to undergo bronchoscopy. Among them, seven cases were proved positive for AFB by bronchoscopic wash whereas gastric aspirate identified 28 patients for AFB by culture. Though bronchoscopy can provide the specimen exactly from the suspected diseased segment, occupational exposure to AFB and other infectious agent through the aerosol is very high while performing a bronchoscopy. Hence, bronchoscopy is preferred only as a last resort in our study when there is a high clinical suspicion or doubt in our diagnosis.

Discussion

Gastric aspiration for AFB though performed in children predominantly, our study emphasises the role of gastric aspiration in adults. The yield following the gastric aspirate for smear, gene x pert and culture by Aslam et al., shows a diagnostic yield of 23.6%, 30.3% and 24.9% [4] which matches with the results of our study. From our study, there is a diagnostic yield of 22.4% overall from 125 patients which is confirmed by culture alone for which the P value is significant (p value-0.009) and by gastric aspirate smear is 24%.

In our study we did not perform gene xpert due to logistic reasons. Rizvi et al showed higher rate of positivity followin g repeated cycles of gastric lavage aspiration and positivity rate increased in subsequent aspiration [5].

There are few studies showing a higher positivity rate in the gastric smear of 52-59% which is comparatively more than our study [6,7]. This may be due to the fact that their sample size was large and atypical mycobacteria could have added onto their positivity rate. Among our patients who were culture positive for AFB on gastric aspirate were not willing for bronchoscopy. Among them, 22 patients were wiling for bronchoscopy out of which 7 patients (were both culture and smear negative on gastric smear and culture) were found to be positive for AFB smear on bronchoscopic wash. This is in concordance with a study by Bahadir et al., that adding sputum induction, gastric aspirate and bronchoscopy will add to the diagnostic yield [8].

The rate of low positivity in bronchoscopy is attributed to antibacterial and growth inhibitory effects of lignocaine to mycobacterium tuberculosis [9]. Dooley et al [10]., identified that there is delay in diagnosis of pulmonary tuberculosis by at least 16 to start on anti tuberculosis therapy in suspected cases of community acquired pneumonia. He also adds in his study that many of the patients with suspected community acquired pneumonia are exposed to respiratory fluoroquinolone before starting them on conventional anti tuberculosis therapy. This may lead to emergence of therapy. This may lead to emergence of fluoroquinolone resi stant strains of pulmonary tuberculosis. This may be one of the reasons for sputum smear negativity due to short course of fluoroquinolone. This also emphasises our need to establish the diagnosis of pulmonary tuberculosis and decide on ATT as soon as possible. We also strongly recommend that the usage of respiratory fluoroquinolone should be limited among Indian population.

We have also performed post gastric aspirate sputum for AFB which has found to be positive for AFB smear among six patients who is probably that most of our patients were not educated properly to submit a sputum sample rather submitting a salivary sample and probably they are not adequately hydrated before submitting the sputum sample. Our study also emphasises the need that all patients who are submitting the sputum sample for AFB should be educated and emphasised on sputum sample submission by doctors, staff and paramedical, social workers and counsellors as how and when to collect sputum sample or information in the form of pamphlets or display charts. We suggest that this may help to avoid false negatives in sputum samples.

Conclusion

From this study, gastric aspirate for smear positivity among sputum smear negative pulmonary tuberculosis was 24% and gastric culture positivity was 22%. Gastric aspirate for AFB smear and culture can be used as a tool in diagnosis of pulmonary in patients who cannot submit sputum and patients who are smear negative as suggested by the study. The gastric aspirate performed in 3 consecutive days may improve the diagnostic yield. DOTS program in India is functioning even at the level of a primary health centre where sophisticated techniques like bronchoscopy are not available. The patient presenting with no sputum under suspicion of tuberculosis, gastric aspirate can be performed as a diagnostic technique which is a simple outpatient procedure. The sample can be subjected for AFB smear study in the lab immediately. The procedure can be performed by trained health care professional like staff nurses, unlike bronchoscopy which needs to be performed by trained bronchoscopist with constant monitoring

Conflict of interest: None.

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