Dedication

To my father

Mother

Brother

And my husband

To all my friends

بسم الله الرحمن الرحيم

قال تعالى :

)وَإِذَا مَرِضْتُ فَهُوَ يَشْفِينِ(

[illegible]

[illegible] **(80)** [illegible]

Acknowledgment

First of all thanks to ALLAH.

I would like to express my sincere gratitude to my supervisor Dr. Humodi Ahmed Saeed, Dean, College of Medical Laboratory Science, Sudan University of Science and Technology, for his close supervision, guidance and patience. Special appreciation to my co-supervisor Dr. Asma El Sony for her keen supervision and encouragement throughout this study.

My thanks are extended to Dr. Mohammed Sidahmed and Dr. Imad El Amin of National Tuberculosis Programme (NTP) for their assistance and support.

Iam grateful and thankful to my brother Mr. Hashim Sir El Khatim and the staff number of El Salam Dialysis Center for their unlimited help and support.

My special thanks are due to my colleagues in the TB laboratories in Red Sea, Bahr El-jabal, Sinnar and Blue Nile States for their remarkable help.

I am very indebted to Miss. Egbal Ali and Mr. Montesir Khear Al said of Sudan University of Science and Technology for technical help.

I would like to thanks my colleagues in reference tuberculosis unit in the National Health and EPI laboratories.

My warmest heart thanks to my friend Mawahib Abed elmoneim Ibrahim for her constant help and support in performing this study.

Abbreviations

AFB	Acid Fast Bacilli
BCG	Bacillus of Calmette-Guerin
HFN	High False Negative
HFP	High False Positive
LFN	Low False Negative
LFP	Low False Positive
MC	Microscopy Center
NTP	National Tuberculosis Programme
QE	Quantitative Errors
SPR	Sputum Positive Rate
TB	Tuberculosis
W H O	World Health Organization
Z.N	Ziehl - Neelsen
D O Ts	Direct observation treatments
PPD	Purified Protein Derivative.
IUATLD	International Union Against Tuberculosis and Lung Disease.
DMC	Direct Microscopy Center.
RNTCP	Revised National Tuberculosis Control Program.
H I V	Human Immunodeficiency Virus.
LQAS	Lot Quality Assurance Sample.
H O A	Horn of Africa
TBMUs	Tuberculosis Microscopy units
NTRL	National Tuberculosis Referance Laboratory

Abstract

This study aimed to assessment of smear microscopy in net work of tuberculosis bacilli by blind rechecking of slides. A total of 288 positive (48) and negative (240) sputum smears were collected from peripheral TB laboratories located in four States (Sinnar, Baher Aljabel, Red Sea, and Blue Nile) using Lot Quality Assurance Sampling technique. The selected slides had been sampled from the slides of the fourth quarter of the year 2005. All slides were checked microscopically at peripheral then re-checked in state level, as first controller, blindly without knowing their previous examination results. Then the smears were cleaned with xylene before being read by the second controller. Most of errors are found in the peripheral stage were as follow HFP are more frequently in Red Sea 6%, while it was low in Bahar El-Jabal 0.1% and HFN more frequently in Blue Nile 3% while it was zero in Bahar El-jabal. LFN and LFP are higher in Red Sea 1.5% while it was zero in Blue Nile and Sinnar state. Quantification errors are found higher in Red Sea 1.5% while they were zero in Sinnar State. The study concluded the important of the quality control, also the implementation of blind rechecking method. for broad action of assessing and following of smear microscopy, Re-staining helped in resolving problems of the false positive and negative which it is due to insufficient decolrization. Also deposition of stain and preparation of smear and staining process, also take time in reading and following the WHO instructions in quantity reading to avoid quantification errors. Also the exact picking of part for smear to avoid thickness and make smear three/four of slide ,avoid heating during fixation.

□□□□□□□□

هدفت هذه الدراسه لتقويم الفحص العشوائى فى الشبكة المجهرية للدرن. تم اختيار 288 مسحة موجبه (240) وسالبه(48) لعصيات السل جرى فحصها فى الربع الرابع من العام 2005 فى اربع ولايات فى السودان، هى البحر الاحمر، النيل الازرق، بحر الجبل وولاية سنار. تضم هذة الولايات احدى و عشرون مركزا للفحص المجهرى.

تم اخذ 15 شريحة عشوائيا من كل مركز. تمت اعادة قراءة الشرائح التى جمعت من المراكز الطرفية فى الولايات (الضابط الاول) مع حجب النتيجة. ثم تمت قراءة الشرائح بعد ازالة الصبغة بالزايلين وصبغها ثانيا (الضابط الثانى). ولقد ابرزت هذة الدراسة انواع الاخطاء وهى اخطاء كبيرة وهى منقسمة الى ايجابى وسلبى

ايضا اخطا صغيره منقسم الى سلبيه وايجابيه صغيره بالاضافة الى الخطا الكمى.

و قد كانت معظم الاخطاء فى المراكز الطرفيية بنسبة 6% للخطاء الكمى الايجابى الكبير فى ولاية البحرالاحمر ومنخفض بولاية بحرالجبل بنسبة 0.1% اما بالنسبة للخطاء السلبى الكبير متكرر فى ولاية النيل الازرق بنسبة 3% فيما كان صفرا فى ولاية بحر الجبل .اما بالنسبة للاخطاءالصغيرة كانت نسبة الخطاء السلبى الصغير والخطاء الايجابى الصغير فى ولاية البحر الاحمر بنسبة 1.5% فيما كان صفرا فى ولاية سنار والنيل الازرق .

اما بالنسبة للخطاء الكمى ففى ولاية البحر الاحمر كان بنسبة 1.5% فيما كان صفرا فى ولاية سنار . و قد خلصت هذة الدراسة الى اهمية ضبط الجودة وتوطين طريقة اعادة الفحص العشوائى لفعاليتها الواسعة فى التقييم والمتابعة لمسحة التفاف المجهرية كما ان اعادة الصبغة يساعد فى حل مشكلة الخطا السلبى و الايجابى وهذا نتيجة لعدم كفاية مزيل اللون و كذالك ترسب الصبغة على الشريحة ايضا تحضير المسحة من حيث سمكها كذالك عملية صبغ اللطاخه و لتجنب ذالك اعطاء زمن كافى لقراءة الشريحة فى اتباع ارشادات هئية الصحة العالمية فى الطريقة الكمية للقراءةحتى نتجنب الاخطاء الكمية .

كما يجب الاختيار الصحيح للاجزاءالمراد بها عمل المسحة مع تفادى السمك وعمل المسحة فى ثلاثة ارباع الشريحة مع تجنب تسخين الشريحة اثناء تثبيت اللطاخة .

Table of contents

	الأية	I
	Dedication	II
	Acknowledgement	III
	Abbreviations	IV
	(Abstract(English	V
	(Abstract(Arabic	VI
	Table of Contents	VII
	List of tables	x
	List of figures	xii
	Chapter One: Introduction and Objectives	
.1.1	Introduction	1
.1.1.1	Rationale	2
.1.1.2	Research questions	3
.1.2	Objectives	3
.1.2.1	General Objective	3
.1.2.2	Specific Objectives	3
	Chapter Two: Literature Review	4
.2.1	The genus Mycobacterium	4
2.1.1	Taxonomy	4
2.1.2	Spatiality of *M.tuberculosis*	4
2.1.3	Description of *Mycobacterium tuberculosis*	4
2.1.4	Natural Habitats	4
2.1.5	Clinical Significance	4
2.2	Microscopy	7
2.2.1	Smear microscopy	7
2.2.2	Smear sensitivity	7
2.2.3	Smear specificity	8
2.2.4	Predictive value	8

2.3	Quality assurance	9
2.3.1	Quality control	9
2.3.2	Quality improvement	10
2.3.3	Proficiency testing	10
2.3.4	Quality assurance in Sudan national tuberculosis programme	11
2.4	External Quality Assurance by Blind Rechecking of slides	11
2.4.1	Slides keeping	11
2.4.2	Taking sample	11
2.4.3	(Blind rechecking (state lab. Coordinator- first controller	12
2.4.4	Identification of discordant	12
2.5	(National reference laboratory (second controller	12
2.5.1	Collection of Specimens	12
2.5.2	Container	12
2.5.3	Collection procedures	13
2.5.4	Procedure	13
2.6	Evaluation sputum quality volume	14
2.6.1	Smear preparation procedures	15
2.6.1.1	Procedure	15
2.6.2	Smear Examination procedures	16
2.6.3	Morphological characteristics of acid- fast bacilli	16
	Chapter Three: Materials and Methods	
3.1	Study Design	18
.3.1.1	Type of Study	18
.3.1.2	Study Area	18
.3.1.3	Target Population	18
.3.1.4	Sampling and Sample Size	18
3.2	Data Collection	18
3.2.1	Collection of Sample	18
3.2.2	Method of re staining	19
3.2.3	Quality Control Parameters	20
3.2.4	Definitions used in Blind Rechecking of Slides	20
3.2.5	Data analysis	21
	Chapter Four: Results	
.4.1	Results	23
	Chapter Five: Discussion	
.5.1	Discussion	48
	Chapter Six: Conclusion and Recommendations	

.6.1	Conclusion	51
.6.2	Recommendations	51
	References	53
	Appendix	57

List of Tables

Table	Page
Table1.Result of peripheral laboratory and first controller(state)with second controller singga hospital	27
Table2.Result of peripheral laboratory and first controller(state)with second controller Sinnar hospital	28
Table3.Rresult of peripheral laboratory and first controller(state)with second controller Alsouki Center	29
Table4. Rresult of peripheral laboratory and first controller(state)with second controller Bados Center	30
Table5. Result of peripheral laboratory and first controller(state)with second controller Army hospital	31
Table6. Result of peripheral laboratory and first controller (state) with second controller Alrosserius Center	32
Table7.Result of peripheral laboratory and first controller(state) with second controller Rowro Centre	33
Table8.Result of peripheral laboratory and first controller(state)with second controller Seriou Centre	34
Table9. result of peripheral laboratory and first controller(state)with second controller Aldamazien centre	35
Table10. Result of peripheral laboratory and first controller(state)with second controller Munki Centre	36
Table11. Rresult of peripheral laboratory and first controller (state)with second controller Katour Centre	37
Table12.Resultofperipheral laboratory and first controller(state)with	38

second controller Jabel Kojour Centre	
Table13. Rresult of peripheral laboratory and first controller(state)with second controller M .T .C. Centre	39
Table 14. Result of peripheral laboratory and first controller (state)with second controller Terkaka Centre	40
41	Table 15. Result of peripheral laboratory and first controller (state)with second controller Alrjaf Centre
42	Table16.Resultof peripheral laboratory and first controller (state) with second controller IDCP Centre
43	Table17.Result of peripheral laboratory and first controller (state) with second controller Tokar Centre
44	Table18.Result of peripheral laboratory and first controller (state) with second controller DaimAlnour Centre
45	Table19.Rresutl of peripheral laboratory and first controller (state) with second controller DarAlnaeem Centre
46	Table20.Result of peripheral laboratory and first controller (state) with second controller Port Sudan Centre
47	Table 21. Rresult of peripheral laboratory and first controller (state) with second controller Swakin Centre

List of figures

Figure number	page
Figure 1. Shows Flowchart for Procedure of Blind Re-checking (NTP, 2004)	22
Figure 2. Comparison between peripheral and second controller results	25
Figure 3. Comparison between first and second controller results	26