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Pulmonary Invasive Fungal Colonization among Diabetic Patients at ALERT Center, in Addis Ababa, Ethiopia

Sebsib Neway*

Department of Diabetology, Jimma University, Jimma, Ethiopia

***Corresponding author:** Sebsib Neway, Department of Diabetology, Jimma University, Jimma, Ethiopia; E-mail: sebsibneway2152@gmail.com

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Abstract

Background information: Coordinated and predesigned overview was made and used for variety of data on socio-portion factors, for instance, age, sex, co-terribleness, length of diabetics, insulin treatment and family heritage was accumulated truly by using a set up data reflection plan from the division of clinical mycology from the selection book on which exploration focus disclosures after assessment of patient's.

Objective: Decide the predominance of aspiratory intrusive contagious colonization among diabetic patients at Ready Center Addis Ababa, Ethiopia from January 2021 to April 2022 was the objective of this review.

Materials and Methods: From January 2021 to April 2022, ready center directed a cross-sectional review. Sputum tests from every one of the 418 diabetes patients were acquired, immunized on Sabouraud dextrose agar, and afterward every member's organism were recognized by ordinary microbiologic strategy.

Results: Of the 418 people with diabetes who were remembered for complete, 59.1% had contagious detaches. As per the recurrence of contagious detaches, yeast diseases were the most well-known, representing 47.1% of cases, while shape contaminations represented 12.3%. *C. albicans*, 21.1%), *C. krusei* (17.5%), *C. tropicalis* (2.4%), *C. rugasa* (1.4%), and blended development (*C. albicans*, *C. krusei*, 3.8%) were the most pervasive species. *Aspergillus niger*, *Scopulariopsis*, and *Penicilium* were viewed as disengaged in 39.9%, 1.4%, and 1.0% of cases, separately.

Conclusions: Contagious colonization happens all the more every now and again in diabetics. As per this review, there is a lot of shape and obtrusive yeast in the lungs. This tracking down suggests that to upgrade patient results for patients with contagious colonization, early analytic, restorative, and patient consideration processes should be moved along.

Keywords: Contagious colonization; Diabetes mellitus; Culture

Introduction

Diabetes Mellitus (DM) is a gathering of metabolic problems described by high blood glucose levels that outcome from deserts in insulin emission or activity or both over a drawn out period. It is the most normal endocrine problem around the world. Inferable from immunologic hindrances following diabetes, it is an intense inclining factor for a wide range of diseases. Patients with uncontrolled diabetes and elevated degrees of glucose (hyperglycemia) leave the integumentary framework [1]. Patients with diabetes are defenseless to contamination and typically require more hospitalization, contrasted and everyone. In non-industrial nations, contamination is one of the three driving reasons for passings in patients with diabetes, and expands the overabundance hazard to fourfold [2].

In 2014, 422 million individuals on the planet had diabetes, a predominance of 8.5% among the grown-up populace in 2017 [3]. The overall commonness of adult-onset diabetes (20-79 years) was almost 425 million, and the World Wellbeing Association (WHO) and the Global Diabetes League (IDF) anticipated that the quantity of grown-ups on the planet with diabetes will ascend close to 629 million constantly 2045 [4].

Diabetes mellitus is a clinical condition related with lack of insulin emission or activity. It is thought of as one of the biggest dangers to wellbeing in the 21st 100 years [5].

High blood glucose levels brought about by irregularities in insulin discharge, activity, or both over a lengthy timeframe portray a bunch of metabolic diseases known as DM. The most predominant endocrine condition on the planet is this one. Diabetes is a strong inclining factor for a wide scope of diseases since it disables the invulnerable framework. Hyperglycemia, or uncontrolled diabetes, makes patients lose their integumentary framework [1]. Diabetes patients regularly need more prominent clinic stays than the typical populace since they are more inclined to disease. Disease is one of the best three enemies of diabetic individuals in emerging countries, and it quadruples the overabundance risk [2].

422 million people overall had diabetes in 2014; in 2017, the occurrence among grown-ups was 8.5%. [3]. The World Wellbeing Association (WHO) and the Global Diabetes

Organization (IDF) assessed that more than 425 million people overall have grown-up beginning diabetes, and that figure will move to around 629 million continuously 2045 [4].

A clinical disease known as DM is connected to insufficient insulin emission or activity. It is viewed as one of the greatest wellbeing risks of the twenty-first hundred years [5].

In India, the predominance of diabetes is 1.1% by and large. India as of now holds the record for having the most diabetic subjects of any country on the planet. As per reports, 62 million Indians have diabetes as of this moment, and by 2025, that figure is supposed to ascend to 89.4 million. This will address 1/ sixth of all diabetics around the world [6].

As per the IDF Chart book, 10.8 million people in sub-Saharan Africa had diabetes in 2006, and that number is supposed to increment to 18.7 million by 2025, an increment of 80%, surpassing the estimated overall increment of 55% [7].

In contrast with non-diabetics, diabetic patients have a higher rate of lung obtrusive parasitic disease. It might have more prominent seriousness, results, and parasite disease weakness. Patients with diabetes have a 1.38-crease expanded chance of mycoses. These organisms contaminations can run in seriousness from minor mucocutaneous diseases that make no side effects foundational contaminations that can be lethal [8].

Human contagious illness isn't surely known, and passings welcomed on by these diseases are oftentimes dismissed. Regardless of these realities, the WHO and most of general wellbeing associations presently have practically zero dynamic mycological observation or control programs on parasitic infections [2]. As per gauges, the parasitic realm contains 6,000,000 species that are broadly scattered in the climate. Among them, a few hundred types of yeasts and molds can have various pessimistic consequences for individuals [9].

Conidia are minuscule contagious spores that are bountiful in the air we relax. In the wake of breathing in these conidia, hosts might encounter side effects going from sensitivity to possibly deadly obtrusive mycoses, or they might hack up blood, have a temperature, or have chest torment [10].

A critical supporter of horribleness and mortality are obtrusive contagious contaminations (IFIs) [11].

General objective

The point of this study was to decide aspiratory intrusive parasitic colonization among diabetic patients at Ready Center Addis Ababa, Ethiopia from January, 2021 to April, 2022.

Specific objectives

- To decide the predominance of pneumonic intrusive contagious colonization.
- To see related element of contagious contamination with diabetic patients.

Materials and Methods

Study area

The area of this study was Addis Ababa, Ethiopia. As indicated by the Focal Factual Organization of Ethiopia's populace registration, Addis Ababa, the nation's capital, has a populace of 3,384,569, with a 3.8% yearly development rate. As per this projection, there would be 4,478,127 individuals living there in 2015. The sickness centered ALERT (All Africa Disease, Tuberculosis and Restoration Preparing Center) emergency clinic was established in 1934 and is a clinical focus on the edges of Addis Ababa. It is arranged 7 kilometers south-west of Addis Ababa in transit to Jimma. The essential objective of Alarm was to teach the two genders on numerous features of sickness illness, like avoidance, therapy, and recovery in an African setting. Notwithstanding a short term office, divisions for dermatology, ophthalmology, medical procedure, pediatrics, gynecology and obstetrics, psychiatry, an ER, a workmanship center, a muscular studio, and a recovery program, there is at present a more than 350-bed instructing emergency clinic. At the short term segment, around 1000 diabetic patients are being checked. The medical clinic is expanding its administrations in different ways of addressing our exploration's requirements for adequate examples and people groups from many socioeconomics.

Study design and period

This study was led at Ready Center Addis Ababa; Ethiopia. A cross sectional review was led on 418 review members for whom sputum tests were gathered. Contagious culture was handled at Ready Center in mycology research facility from January, 2021 to April, 2022.

Source population

Our source populaces were those whole going to short term offices at ready center during the review time frame.

Study population

Every one of those affirmed to be diabetics were considered as study members and all diabetic patients were educated about the reason regarding the review and their assent was looked for the review. The patient's composed assent was acquired before the direct of the review.

Inclusion criteria

All patients who were affirmed to be diabetics.

Exclusion criteria

- All thought patients who was not created diabetic.
- Diabetic patients who were not able to take part in the review.

Data collection procedures

Organized and predesigned poll was created and utilized for assortment of information on socio-segment factors, for

example, age, sex, co-dreariness, span of diabetics, insulin treatment and family ancestry was gathered physically by utilizing a pre-arranged information reflection design from the branch of clinical mycology from the enrollment book on which research center discoveries after examination of patient's.

Laboratory investigation

Sample collection: Patients were essentially taught to wash their mouth tenderly with regular water ready for this reason at least a time or two and afterward gather purulent sputum by sterile bird of prey tube by breathing profoundly multiple times. Test assortment was completed under the management of a certified clinical research facility technologist.

Fungal isolation and characterization: Natural sputum was immunized straightforwardly onto two SDA tubes enhanced with chloramphenicol (Oxoid, Basingstoke, UK) under biosafety bureau level II. All immunized cylinders will then ship to the division of clinical research facility science, composition of wellbeing science and Addis Ababa College. One of the cylinders was brooded 25°C; the other one was hatched with 35°C -37°C vigorously for as long as about a month culture tubes were inspected day to day for any contagious development.

Identification

Mold identification: By inspecting their tiny and naturally visible elements, mycelia parasite were found. For perceptible distinguishing proof, each culture's front side pigmentation, surface, geography, and pace of development were thought about. Using a lactophenol cotton blue staining technique, the minuscule qualities of mycelial organisms were distinguished. On a spotless glass slide, a drop of Lactophenol Cotton Blue (LPCB) stain was applied. For the staining system, a piece of parasitic culture was put on clean, glass slides that contained LPCB. Utilizing the magnifying lens' 10X and 40X targets, a stained planning was then reviewed for tiny characteristics such miniature conidia, the morphology of regenerative designs, and the cosmetics of hyphae.

Yeast identification: Yeasts was recognized by microbe tube creation, and utilizing CHROMagar Candida culture medium (Becton Dickinson) according to the guidance of the producer.

Data analysis and interpretation

Information passage and investigation was performed by involving Measurable Bundle for the Sociologies (SPSS) factual programming adaptation 25 as indicated by the review goals. The unmistakable insights was determined and strategic relapse examinations were utilized to see the connection among reliant and free factors. The degree of importance was at 0.05 to consider a p-esteem <0.05 as mark of a genuinely massive contrast with 95% certainty span.

Ethical considerations

Preceding information assortment, the review got the expected help letter from the review site and parental or lawful gatekeeper composed informed assent from each qualified review member. The Division of Clinical Lab Science Departmental Exploration and Morals Survey Council (DRERC) at Addis Ababa College gave their endorsement for the review, trailed by the Ready Morals Audit Board of trustees (AERC). The review's point was to illuminate the members about the review's motivation, their capacity to decline cooperation, and the secrecy of the information gathered. The review members who had a parasitic colonization and had a positive contagious culture result were alluded to the OPD, which was analyzed for better administration and to endorse the legitimate prescriptions considering the positive parasitic culture result.

Dissemination of Result

Concentrate on results were introduced in scholarly gathering at Addis Ababa College School of Wellbeing Sciences, Branch of Clinical Lab Science, ALERT, Ethiopia wellbeing nourishment research establishment and meetings. A duplicate of the proposition was made accessible at the Addis Ababa college clinical lab science division library and Ready library.

Results

Demographic characteristics of the pulmonary invasive fungal colonization among diabetic patients

During the review time frame a sum of 418 diabetic patients were selected which involves Female had 228 (54.5%) members, the middle periods of the patients were 60 years (scope of 16 to 87 years). Of 418 diabetic patients, 247 (59.1%) had contagious segregates. The recurrence of contagious segregates showed that most transcendent Yeast diseases were 197 (47.1%), while Shape contaminations represented 49 (12.3%). The most successive *Candida* species was *C. albicans* 88 (21.1%), *C. krusei* 73 (17.5 %), *C. tropicalis* 14 (2.4%), *C. rugasa* 6 (1.4%) and blended development *C. albicans* and *C. krusei* 16(3.8%). It was seen that a *Niger*, *Scopulariopsis* and *Penicilium* were separated at a recurrence of 39 (9.9%), 6 (1.4%) 4 (1.0%) individually (Table 1).

Table 1: The frequency of fungal isolates from diabetics patients.

Fungal isolate	Frequency (%)
Aspergillus niger	39 (9.9%)
Penicilium	4 (1.0%)

Scopulariopsis	6 (1.4%)
Candida albicans	88 (21.1%)
Candida krusei	73 (17.5%)
Candida tropicalis	14 (2.4%)
Candida rugasa	6 (1.4%)
Candida albicans and *Candida krusei*	16 (3.8%)
Total	247 (59%)

The dispersion of contagious segregates recommended that the multivariable strategic relapse examination model was utilized to investigate the segment parts of parasitic development and the related component. Factors with a p worth of under 0.25 in the bi-variable examination were remembered for the multivariate strategic relapse investigation. Subsequently, the accompanying factors were remembered for the multivariate investigation: Age, orientation, insulin treatment, FBS, HgA1c, co-horribleness, span of diabetes, and family ancestry.

The circulation of the contagious secludes by orientation and age was genuinely connected with risk (p-esteem 0.05). AOR=2.0; 95% CI: 1.3, 3.2; p=0.002 had nearly multiplied parasitic contaminations than the guys 97(51.1%) were genuinely huge for the chances of contagious development of hazard factor among females (Table 2). The age bunch for organisms development was related with various boundaries, including.

Table 2: Factors associated with demographic characteristics of fungal growth.

Variables	Participant	Isolates (%)	AOR (95% CI)	P–value
Gender				
Male	190	97 (51.1%)	REF	
Female	228	150 (65.8%)	2.0 (1.3,3.2)	0.002
Age				
≤ 30	25	14 (56%)	REF	
31-40	70	42 (60%)	2.0 (0.9, 4.2)	0.06
41-50	90	54 (60%)	2.0 (1.0, 3.9)	0.03
51-60	113	54 (47.8%)	2.7 (1.4,4.9)	0.01
≥ 61	120	83 (69%)	2.8 (0.9,8.1)	0.05

Factors associated with risk factors towards pulmonary pulmonary invasive fungal colonization

The outcome from the multivariable examination showed that on insulin treatment, co-bleakness, HgA1c and length of DM factors were essentially connected with aspiratory obtrusive parasitic colonization in bi-variable calculated relapse examination were taken for multivariable investigation. The odd proportion contagious development of hazard factor related with on insulin treatment was (AOR=1.5 95% CI: 0.9, 2.6 p=0.08) had one and half times 151(54.3%) higher contrasted and not utilized (Table 3). Then again, the chances of aspiratory obtrusive parasitic colonization among risk factor with co-dreariness was (AOR= 1.5 95% CI: 0.9, 2.5 p=0.05) times higher individually, when it is contrasted and no co-bleakness patients. The chances of pneumonic obtrusive contagious colonization among risk factor was additionally high HgA1c esteem 8-15 (AOR=2.0 95% CI: 1.1, 3.5 p=0.01) times than HgA1c 5-7 worth. The gamble factors that were evaluated shown that length of diabetes was measurably huge for aspiratory obtrusive parasitic contamination in diabetics, when, the diabetic patients with >11 years term (AOR=2.3 95% CI: 0.9, 5.5 p=0.06) times contagious development than those contrasted and under 1-years diabetic patients. Nonetheless, family ancestry and fasting glucose was not measurably importance (Table 3).

Table 3: Clinical characteristics of risk factors associated with culture isolated.

Variables	Participant	Isolates (%)	AOR (95% CI)	P–value
Insulin therapy				
No	278	151 (54.3%)	REF	
Yes	140	96 (68.8)	1.5 (0.9,2.6)	0.08
Co-morbidity				
No	247	131 (53%)	REF	
Yes	121	116 (67.8%)	1.5 (0.9, 2.5)	0.05
HgA1c				
5-7	153 (36.8%)	159 (54.8%)	REF	
8-15	265 (63.4%)	38 (68.7%)	2.0 (1.1, 3.5)	0.01
Duration of DM				
<1	87	37 (42.5%)	REF	
2-5	157	106 (67.5%)	0.8 (0.3,2.0)	0.7
6-10	121	63 (52.1%)	2.0 (0.9,4.5)	0.08
≥ 11	53	41 (77.4%)	2.3 (0.9,5.5)	0.06
FBS				
75-170	246	137 (55.7%)	REF	
≥ 171	172	110 (64%)	0.8 (0.5,1.4)	0.6
Family history				
No	360	205 (56.9%)	REF	
Yes	58	42 (72.4%)	1.9 (0.9,3.8)	0.6

Discussion

By 2035, 593 million individuals overall are anticipated to have DM, making it a significant worldwide wellbeing concern [12].

The reason for this study was to find factors that impact lung obtrusive contagious colonization in diabetic people. As indicated by the review, there is a measurably critical relationship between's various boundaries, including insulin treatment, HgA1c, co-dismalness, and length of diabetes, and parasitic turn of events. In this study 247 (59.1%) of the 418 diabetic patients in the commonness study had an organism development, a comparative nature did in Nigeria by Udeani TK, et al., announced that (52.5%) [5]. An ascent in glucose levels could be a gamble factor for this high pervasiveness, as per Moore I, et al. [13] are not very much made due, the disease might spread to other body parts. This organism disconnects were more uncommon than those tracked down in DM patients by Raza M, et al., (31.58%) [6], this might be might be at fault for test size or review members.

In this review, female diabetic patients had a recurrence of 65.8% more prominent contagious diseases than male ones. A connected report was accounted for Eba M, et al., (77%) [14,15]. As per the consequences of the flow study, there is serious areas of strength for a between lung obtrusive parasitic colonization and age gatherings >61 (69%); this finding is in accordance with research done in Nigeria. This might be the consequence of a mix of maturing, more medication, and diminished insusceptibility, as per Udeani TK, et al [5,6]. Furthermore, HgA1c affects lung obtrusive parasitic colonization; a contagious contamination pace of more noteworthy than 8%-15% was higher than the control pace of 5%-7%. When contrasted with

different investigations, this finding was similarly equivalent Sewify M, et al. >8.3% and Kareliya H, et al. >8% [16,17].

The ebb and flow research found that people with DM who had been analyzed for over 11 years had a higher commonness of lung obtrusive contagious colonization than different gatherings; this study similar to study led Raza M, et al. [6], this may be on the grounds that astute contaminations created in such patients before their diabetic condition was known, due to early misdiagnosis.

The family ancestry and quick glucose affected the result of aspiratory obtrusive contagious contamination.

The most common yeast disease, candida, is welcomed on by an excess of yeast in any piece of the body. In the ongoing examination, *Candida* was the most well-known growth to be recognized from sputum tests (47.1%), trailed by *Aspergillus* (12.3%). detailed in a near research. Abu-Elteen, et al. (58.3%), Lao M, et al. (55.4%) [6,18], this might be on the grounds that overabundance glucose takes care of yeast cells, or it could be on the grounds that diabetes patients are bound to have high glucose levels, which debilitate the safe framework and result in various medical problems.

These outcomes the *Candida* species with the most noteworthy parasite development was *C. albicans* (21%). Contrasting these parasite disengages with Abu-Elteen, et al., (81.8%) and Yismaw G, et al., (42%) [18, 19].

The disparity in the discoveries of a few explores could be the result of various review populaces and study locales. The concentrate's subsequent outcomes were just *C. krusei* (17.5%) was available. As indicated by before research, a review that was directed found a more noteworthy commonness contrasted with research by Falahati M, et al., (10.5%) and Kareliya H, et al., (6%) [1,17]. The third most common *Candida* species, *C. tropicalis*, was analyzed in the ongoing review (2.4%) this study's contagious confines were not exactly those tracked down in an earlier examination of diabetic people by Yismaw G, et al., (15.8%) [18,19]. This could be on the grounds that there are extra sugars present, which urge yeast to colonize at undesirable levels since yeast benefits from sugar, this development is no doubt brought about by these emissions.

One of the most continuous species to nauseate those with hindered resistant frameworks is *Aspergillus*. A risky pathologic problem much of the time influences insusceptible compromised patients and is welcomed on by *Aspergillus* species. F. Ghanaat, et al. [20]. As indicated by this disclosure the commonness of contagious colonization *A. Niger* makes up the greater part (9.9%) of shape contagious separates. Iqbal N, et al., completed a tantamount report were found (10.1%) [21].

These parasites developed more than whatever Mwaura EN, et al., had found (2.3%) [22], this might be credited example type or physical site contrasts proposed that obtrusive Aspergillosis is a possible deadly confusion of serious liver sickness. Because of immunosuppression after liver transplantation, this has occurred. Be that as it may, liver illness alone inclines toward bacterial and parasitic disease because of a downturn of both humoral and cell-intervened resistance.

In this examination, sputum tests filled in as the wellspring of all the contagious confines. In the present led study, *Penicillium* was viewed as one of the pneumonic obtrusive parasitic colonization at a commonness of 1%. This parasitic secludes were lower than discoveries by Bitew An, et al.; 12.5%, Kareliya H, et al. [17]. Populace contrasts or creature burden might be to be faulted for this. In the present directed examination, diabetic patients had a Scopulariopsis parasitic development of (1.4%). The improvement of parasite balls in lung depressions that have proactively been made is a part of serious human mycoses [23].

The vitally pathogenic systems for pneumonic obtrusive contagious colonization in diabetic patients are: A hyperglycemic climate that expands the destructiveness of certain contaminations; a decreased age of interleukins because of disease. Diseases in individuals with diabetes might be more hazardous and lead to metabolic issues such hypoglycemia and ketoacidosis.

Conclusion

A hyperglycemic climate that advances the harmfulness of certain diseases and a diminished creation of interleukins in light of contamination are the critical pathogenic components for lung obtrusive parasitic colonization in diabetes people. Diabetes patients might be more in danger for contaminations that cause metabolic issues including hypoglycemia and ketoacidosis.

Irreconcilable circumstance the creators assert that they have no interests in rivalry with each other.

Conflict of Interest

The authors affirm that they have no interests in competition with one another.

Authors' Contributions

Miftah Umer and Dr. Adane designed the study, drafted the manuscript, and were involved in the subject recruitments. Sebsib Neway performed data analysis. All authors read, approved, and contributed to this final draft.

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