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Diseases

Cancer, Ophthalmology & Pediatric

Evaluation of Diaphragm Function

Football Players of Specific Amplua

Highlights

Children with Urinary Tract Infection

Role of Predictors in the Development

Discovering Thoughts, Inventing Future

VOLUME 23 ISSUE 4 VERSION 1.0

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Special Features of Heart Rhythm and Conductivity Disorders in Football Players of Specific Amplua

By Nozimakhon U. Agzamkhodjaeva, Rano K. Islamova
& Iskandar R. Mavlyanov

Abstract- This article presents the results of a study of the peculiarities of cardiac rhythm and conduction disturbances in professional football players performing in specific energy-intensive positions on the field. The correlation of the revealed violations on the electrocardiogram with the presence of bradycardia and the level of physical performance was carried out. It was found that among football players playing in the positions of a defensive midfielder and a lateral defender, both rhythm and conduction disturbances, which characterize a high degree of heart adaptation to physical stress, and disturbances that are an indicator of maladjustment to stress, are expressed.

Keywords: heart rhythm and conduction disorders; professional football players; electrocardiogram; adaptation to physical activity.

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Nozimakhon U. Agzamkhodjaeva [α], Rano K. Islamova [σ] & Iskandar R. Mavlyanov [ρ]

Abstract- **This article presents the results of a study of the peculiarities of cardiac rhythm and conduction disturbances in professional football players performing in specific energy-intensive positions on the field. The correlation of the revealed violations on the electrocardiogram with the presence of bradycardia and the level of physical performance was carried out. It was found that among football players playing in the positions of a defensive midfielder and a lateral defender, both rhythm and conduction disturbances, which characterize a high degree of heart adaptation to physical stress, and disturbances that are an indicator of maladjustment to stress, are expressed.**

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I. Introduction

According to various studies, in professional athletes, changes in the electrocardiogram (ECG) in chronic overstrain of the cardiovascular system, requiring an in-depth examination by a cardiologist, are up to 40%, while in people involved in sports only periodically, only 12% [1, 2, 3]. Modern standards in the interpretation of the ECG in athletes should include the determination of the change in indicators both in relation to the healthy part of the general population, and in relation to the ECG indicators in athletes, which are defined as the norm and reflect physiological adaptation to physical activity [4,5,6].

During preventive examinations, professional athletes often reveal electrocardiographic and hemodynamic disorders, which can be both a consequence of maladaptation processes and a consequence of organic cardiological pathology [9,11,12].

Today, football is one of the most popular team sports and the level of competition among professionals has increased significantly. In connection with the increased level of competition and the popularization of the sport itself, the requirements for professional football players have also increased, which, in turn, dictates the need for a deeper medical examination, taking into account the specifics of not only the playing sport itself, but also the specifics of the duties of the players on the field. Based on the foregoing, the study of cardiac arrhythmias and conduction disturbances, which are a manifestation of heart maladjustment, in football players playing in specific energy-consuming positions is relevant.

Purpose of the study is to investigate the features of heart rhythm and conduction disorders in football players playing specific roles.

II. Material and Research Methods

The high level of competition in modern professional football has greatly complicated the game itself and the degree of tactical component in it. Today, football players, starting from a young age, are played in certain positions, which narrows the range of their duties on the field and affects the formation of the physiological properties of the body. In modern football, many positions or roles have appeared that require the player to have certain physical qualities that the athlete has been training for many years. Given the specifics of the style of play at the present time, among the numerous roles in football, two positions can be distinguished that require the highest performance and endurance from an athlete - the position of an extreme defender (in the specific language of football is called " lateral " or in the specific language of football is called "libero"). Players from both positions cover the longest distances during matches and their style of play requires tremendous stamina on the pitch [7,8,10]. In this regard, the analysis of rhythm and conduction disturbances was carried out in these groups of players, as the most at risk of developing heart maladjustment to physical exertion.

The study included 77 football players, who are the representatives of main and reserve squads from 11 teams of the country's professional league. Among the surveyed, 40 players played in the position of a defensive midfielder, the average age was 25.27±4.97 years, and 37 players played in the position of fullback, the average age was 23.86±4.91 years. During the planned in-depth medical examination, all football players underwent an ECG at rest, a study of general performance (PWC_{170}, kgm/min/kg) using bicycle

Author α: Republican Scientific and Practical Center for Sports Medicine, Tashkent, Uzbekistan. e-mail: author.uzb@mail.ru
Author α: Republican Specialized Scientific and Practical Medical Center for Cardiology.
Author σ: Zangiota Specialized Infectious Diseases Hospital #2.

ergometry and the value of maximum oxygen consumption (MIC, ml/min/kg) in terms of PWC_{170}.

Football players with previously identified organic diseases that can cause rhythm and conduction disturbances were excluded from the study. Thus, this study was aimed only at studying rhythm and conduction disturbances as an indicator of heart disadaptation as a result of an irrational physical training regimen.

III. Results and Discussion

Analysis of the ECG showed that sinus bradycardia was detected in 65% of football players playing in the position of a defensive midfielder (average heart rate 56.23±8.83 per minute) and 73% of football players who played in the position of fullback (average heart rate 55.5±8.79 per minute) min). Bradycardia is one of the most common ECG findings in athletes, including team sports. Applicable to football players, a decrease in heart rate (HR) less than 60 per minute, without the presence of organic pathology, can be a normal variant and a positive indicator indicating the athlete's fitness and his high cardiorespiratory endurance.

An analysis of the prevalence of arrhythmias in the examined football players showed that such conditions as sinus arrhythmia, pacemaker migration, supraventricular and ventricular extrasystole, and changes in ventricular repolarization in the form of shortening and lengthening of the QT interval occurred with approximately the same frequency within 7.5-20%. At the same time, attention should be paid to the fact that sinus arrhythmia and pacemaker migration were inherent in all cases of football players with identified bradycardia. Migration of the pacemaker on the ECG is also a normal variant in athletes, if it is not accompanied by the presence of appropriate symptoms [11,12].

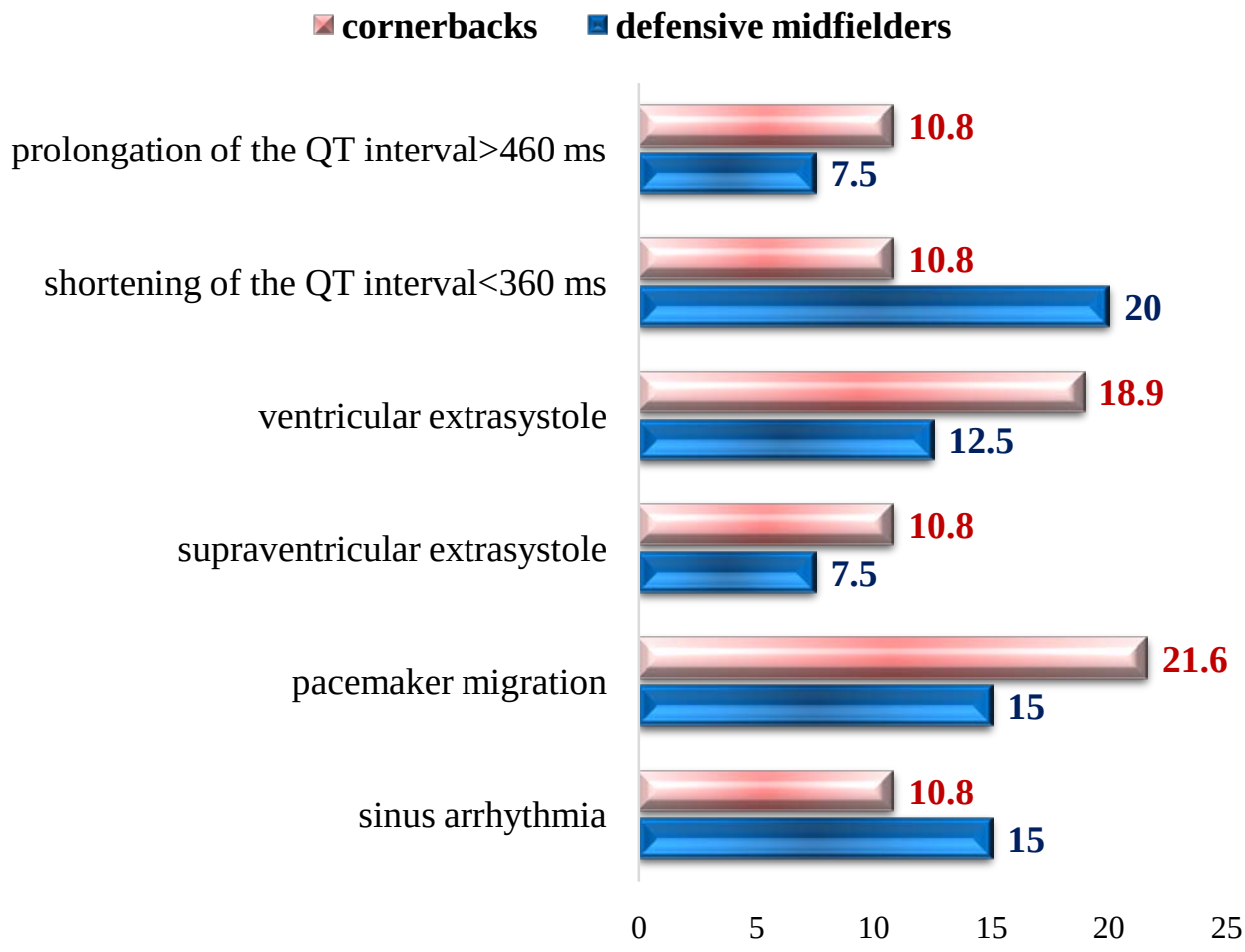

Figure 1: Prevalence of cardiac arrhythmias in football players.

Sinus or respiratory arrhythmia is typical for young athletes and its episodes become more frequent with increasing training. Some athletes have a pronounced sinus arrhythmia with a difference of 0.6 seconds, which disappears on the ECG during exercise [13,14]. The rest of the aforementioned arrhythmias occurred in football players with a heart rate of more than 60 beats per minute (Fig. 1). So, in athletes with

identified violations of the processes of repolarization, symptoms of a decrease in indicators of physical endurance and working capacity were determined.

An analysis of the prevalence of conduction disorders revealed only one case of AV blockade of the 1st degree in players of both groups and 1 case of incomplete blockade of the right branch of the His bundle and complete blockade of the right or left branch of the His bundle. At the same time, AV blockade of the 1st degree and incomplete blockade of the right bundle branch of His were detected only in football players with sinus bradycardia (Fig.2). Atrioventricular dissociations with normal complexes are also sometimes also found in athletes. Their feature is that during functional tests, atrioventricular conduction is restored to normal values. Atrioventricular blockade of the 1st degree, according to statistics, occurs in approximately 2% of healthy athletes and in 10–30% of athletes involved in cardiorespiratory endurance training [15,16].

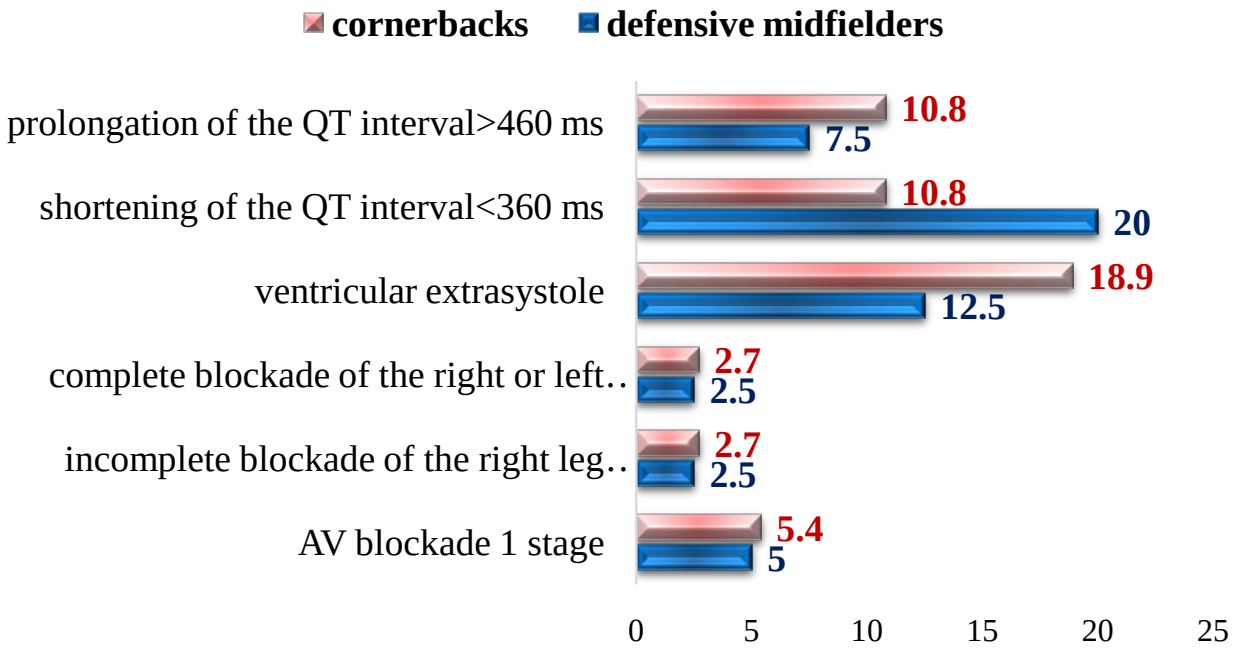

Figure 2: The prevalence of cardiac conduction disorders in football players.

In terms of physical performance, it was determined that in football players with identified rhythm and conduction disorders in sinus arrhythmia, pacemaker migration, 1st degree AV blockade and incomplete blockade of the right bundle branch block showed that value of PWC_{170} ranged from 23.5 to 25.5 kgm/min/kg. Value of the maximum oxygen consumption (MOC) was in the range of 56.4-59.8 ml/min/kg. In football players with identified rhythm and conduction disturbances in the form of supraventricular and ventricular extrasystoles, changes in ventricular repolarization in the form of shortening and lengthening of the QT interval and complete blockade of the right and left bundle branches of His, the value of PWC_{170} ranged from 20.3 to 22.6 kgm/min/kg. Value of the MOC was in the range of 54.3-56.4 ml/min/kg.

IV. Conclusion

Thus, the analysis of the ECG results showed that professional football players with high performance indicators normally have rhythm and conduction disturbances, which, depending on the type, may be indicators of a high or low level of physical development and training of an athlete. In most cases, they can be considered as a compensatory reaction associated with changes in myocardial contractility, as evidenced by the ability or inability of such athletes to demonstrate a high level of performance in training and during official matches.

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Bacteriological Profile and Antibiotic Sensitivity Patterns in Children with Urinary Tract Infection: A Cross-Sectional Study in the Northern Part of Bangladesh

By Kamrun Nahar, Ahmed Rashidul Hasan & Nowrozy Kamar Jahan

Monash University

Abstract- *Purpose:* Urinary tract infection (UTI) is a prevalent infection in children. Over the years, the sensitivity and antimicrobial resistance patterns against uropathogens causing this infection have continuously changed. Pediatricians need updated knowledge of the antimicrobial sensitivity and resistance patterns of common uropathogens to provide appropriate treatment. This study aimed to determine the spectrum of causative uropathogens' antimicrobial sensitivity and resistance patterns in pediatric patients.

Methods: A single-center, cross-sectional study was conducted from February 2021 to January 2022 at the tertiary care hospital in Rangpur, Bangladesh's northernmost division. A total of 200 children aged 0 months to 12 years with clinically suspected UTIs were enrolled in the study. Researchers reviewed the study participants' medical records and sent the urine sample for routine and microscopic examination and culture sensitivity testing.

Keywords: *urinary tract infection. children. bacteriological profile. antibiotic sensitivity.*

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Bacteriological Profile and Antibiotic Sensitivity Patterns in Children with Urinary Tract Infection: A Cross-Sectional Study in the Northern Part of Bangladesh

Antibiotic Sensitivity in Children with UTIs

Kamrun Nahar [α], Ahmed Rashidul Hasan [σ] & Nowrozy Kamar Jahan [ρ]

Abstract- *Purpose:* Urinary tract infection (UTI) is a prevalent infection in children. Over the years, the sensitivity and antimicrobial resistance patterns against uropathogens causing this infection have continuously changed. Pediatricians need updated knowledge of the antimicrobial sensitivity and resistance patterns of common uropathogens to provide appropriate treatment. This study aimed to determine the spectrum of causative uropathogens' antimicrobial sensitivity and resistance patterns in pediatric patients.

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Results: Out of 200 children,94 (47%) were identified as having presumptive UTIs due to significant pyuria, and 58 (29%) were diagnosed with confirmed UTIs. *Escherichia coli* was the most isolated (62%) pathogen. Among gram-negative bacteria, *Klebsiella species* (15.5%) were the second most common, and *Enterococcus faecalis species* (8.62%) were the most common among gram-positive bacteria. Nitrofurantoin (97%) was highly sensitive, followed by ciprofloxacin (93%). On the other hand, cefixime (97%), cotrimoxazole (81%), amoxicillin (72%), aztreonam (72%), and ceftriaxone (67%) were highly resistant to uropathogens.

Conclusions: In Bangladesh's northernmost regions, previously used amoxicillin and cephalosporin groups of drugs are no longer helpful in treating UTIs among children, as this study suggested nitrofurantoin and ciprofloxacin as the most appropriate antibiotics.

Keywords: urinary tract infection. children. bacteriological profile. antibiotic sensitivity.

Author α: Combined Military Hospital, Rangpur, Bangladesh.
Author σ: Bangladesh Shishu (Children) Hospital, Dhaka, Bangladesh.
Corresponding Author ρ: Jeffrey Cheah School of Medicine and Health Sciences, Monash University Malaysia, Selangor Darul Ehsan, Malaysia.
e-mail: nowrozy.jahan@monash.edu

List of abbreviations
CFU: Colony forming units
CMH: Combined Military Hospital
CRF: Chronic renal failure
E. coli: Escherichia coli
ESRD: End-stage renal disease
HPF- High Power Field
UTI: urinary tract infection

Significance

What is already known on this subject?

- Traditionally, UTIs have been treated empirically with either injectable or oral antibiotics, such as the cephalosporin group of drugs, levofloxacin, trimethoprim-sulfamethoxazole (cotrimoxazole), and nitrofurantoin.

What this study adds?

- In the northernmost regions of Bangladesh, the amoxicillin and cephalosporin groups of drugs are highly resistant to uropathogens.
- Nitrofurantoin and ciprofloxacin are the most appropriate antibiotics for preventing long-term complications from UTIs.

I. Introduction

Urinary tract infection (UTI) is the clinical condition when bacteria enter the urethra to infect the different parts of the urinary tract (Centers for Disease Control and Prevention, 2021). It is a significant cause of morbidity and mortality in the pediatric age group (Foxman, 2002) and an essential indicator of underlying urinary tract anomalies (Laila et al., 2012). During the first year of life, males are affected frequently (Kanellopoulos et al., 2006), although the UTI incidence substantially increases among females with age (Al-Badr & Al-Shaikh, 2013; Harrington & Hooton, 2000; Moreno, 2016). Although the outcome of UTI is usually benign, it may be associated with long-term complications (Tan & Chlebicki, 2016). Therefore, prompt diagnosis and early initiation of appropriate antibiotics are required to reduce morbidities with

devastating consequences such as chronic renal failure (CRF) and end-stage renal disease (ESRD) (Nazme et al., 2017; Saadeh & Mattoo, 2011; Shrestha et al., 2013; Spoorenberg et al., 2013).

Urine culture and sensitivity are the gold standards for diagnosing UTIs (Schmiemann et al., 2010). Antibiotic selection should depend on the pattern of uropathogens and their antimicrobial sensitivities in the local environment. Usually, antimicrobial vulnerability testing of urine is achieved within 48-36 hours of sampling (Akoachere et al., 2012). Therefore, in most UTI cases, treatment choice is empirical and experimental, influenced by available data reflecting antibiotic sensitivity and resistance in geographical regions. On culture, a group count of $>10^5$ colony forming units (CFU)/ml organisms of a single uropathogen in the midstream urine of girls and $>10^4$ CFU/ml organisms in boys are measured as confirmatory of UTI (Nazme et al., 2017; Srivastava & Bagga, 2016). A pure growth of $>10^5$ CFU/ml is considered 95% susceptibility, and 10^4-10^5 CFU/ml is categorized as 'infection likely' from catheterized urine samples (Cheng & Wong, 2005) or growth of any number of uropathogens from urine obtained by suprapubic aspiration is considered significant bacteriuria (Christopher D Doern & Susan E Richardson, 2016).

Escherichia coli (*E. coli*) has been reported to be the most common pathogen for symptomatic UTI (90%) in children. Other common bacteria are *Proteus, Klebsiella, Pseudomonas*, and *Enterobacter* (Akram et al., 2007; Islam et al., 2010; Nazme et al., 2017; Srivastava & Bagga, 2016). Viruses and fungi may also cause UTIs among children (Clark et al., 2010). Traditionally, UTI has been treated empirically with either injectable or oral antibiotics such as the cephalosporin group of drugs, levofloxacin, trimethoprim-sulfamethoxazole (cotrimoxazole), and nitrofurantoin (Wagenlehner et al., 2008). Several studies conducted in tertiary care hospitals located in the central region of Bangladesh found that these antibiotics are no longer beneficial to treat UTIs in children due to high resistance levels against causative uropathogens (Islam et al., 2019; Nazme et al., 2017; Shams et al., 2021).

To our knowledge, no study has been conducted in the Rangpur division, the northernmost part of Bangladesh, where the total number of children under 14 was 4,220,773 (ZhujiWorld, 2023). Therefore, the study objective was to determine the spectrum of causative agents of UTIs, their antimicrobial sensitivity, and resistance patterns in pediatric patients of a tertiary care hospital located in the northernmost part of Bangladesh so that pediatricians can predict the causative organisms before providing empirical treatment, thus preventing long-term complications from UTIs.

II. Materials and Methods

a) Study design and participants

It is a single-center, cross-sectional study conducted at the Combined Military Hospital (CMH), Rangpur, a tertiary care hospital located in the Rangpur division, Bangladesh's 7th and northernmost division (Wikiwand, 2023). This observational study was conducted between February 2021 and January 2022. A total of 200 children aged 0 months to 12 years with clinically suspected UTIs either attended the pediatric outpatient department or were admitted to the indoor department during the study period and were enrolled as the study participants after the researchers received either their parents' or caregivers' verbal informed consent.

b) Clinical data collection

Researchers reviewed the study participants' medical records to collect their demographic data (age & sex) and clinical data, including common, urinary, and general complaints. Thereafter, study participants' urine samples were sent for routine and microscopic examination and culture sensitivity testing. In the case of neonates, urine analysis was performed if patients presented clinical evidence of sepsis.

Before collecting urine samples, mothers or caregivers received brief training to follow the steps related to sample collection aseptically and properly before depositing them in the laboratory on time. Older children (7-12 years) were asked to collect early morning midstream urine samples after properly cleaning their external urethra and perineum with plain water without soap. In the case of young infant patients, the best way was to obtain urine for culture aseptically by urethral percutaneous supra-pubic bladder aspiration to avoid the potential chance of contaminated urine cultures that often happens from bag specimens. However, it was not possible to perform this, as the parents did not provide consent to this procedure. Hence, under the supervision of parents, these young children were advised to clean the perineum and peri-urethral area before collecting urine samples by using sterile plastic bags or wide-opened mouth containers supplied by the laboratory.

All samples were collected within 30 minutes of voiding urine. The collected urine samples were then transported to the pathology laboratory of the same hospital and stored at 4°C after adding a few drops of acetic acid, which prevented the growth of organisms. These urine samples were analyzed by microscopic examination followed by bacteriological culture and antibiotic sensitivity testing.

c) Statistical analysis

We analyzed the data in MS Excel 2010 and SPSS version 24.0 for Windows (SPSS Inc., Chicago). We conducted descriptive analysis and summarized the categorical data in counts and percentages.

III. Results

In this study, urine samples from 200 children with suspected UTIs were sent for routine microscopic analysis followed by bacteriological culture and antibiotic sensitivity testing. Among them, only 94 children (47%) were diagnosed with presumptive UTIs due to the presence of significant pyuria [>5 WBCs/high power field (HPF)](C. D. Doern & S. E. Richardson, 2016). In this results section, we present the study findings of these 94 presumptive UTI cases when the urinalysis result was positive for pyuria; among them, 35 (37%) were indoor admitted patients, 59 (62.7%) were outdoor department patients, 36 (38.3%) were male, and 58 (61.7%) were female. Out of 94 presumptive UTI cases, urine culture was positive due to significant organism growth in 58 cases (29% of all suspected cases and 62% of presumptive UTI cases), and these were considered "confirmed UTIs".

Table 1 shows the age and sex distribution analysis of the presumptive UTI cases, where we found the highest (57%) presumptive UTI cases among the younger age group (<5 years) and the lowest (17%) cases among the older age group (>10 years); the presumptive UTI cases were also higher among female children than among male children, leading to a male: female ratio of 0.62:1. We also found a similar age distribution among the urine culture-positive and urine culture-negative cases, i.e., the younger group (<5 years) suffered the most. Regarding the sex distribution analysis, the male: female ratio was 0.87:1 among 58 patients with uropathogens in their urine cultures (culture-positive), and the male: female ratio was 0.33:1 among 36 urine culture-negative cases.

Table 1: Distribution of presumptive UTI cases by sex and age

Age group	Presumptive UTI (n = 94)		Male (n=36)		Female (n=58)	
	Number	%	Number	%	Number	%
<5 years	54	57.45%	18	19%	36	38.3%
5-10 years	24	25.55%	11	11.7%	13	13.82%
>10 years	16	17%	7	7.45%	9	9.57%
	Urine culture positive (n=58)		Male (n=27)		Female (n=31)	
	Number	%	Number	%	Number	%
<5 years	26	44.83%	13	22.41%	13	22.41%
5-10 years	20	34.48%	9	15.52%	11	18.97%
>10 years	12	20.69%	5	8.62%	7	12.06%
	Urine culture negative (n=36)		Male (n=9)		Female (n=27)	
	Number	%	Number	%	Number	%
<5 years	28	77.78%	5	13.88%	23	63.88%
5-10 years	4	11.11%	2	5.56%	2	5.56%
>10 years	4	11.11%	2	5.56%	2	5.56%

Table 2 presents the prevalence of gram-negative and gram-positive pathogens that were isolated during urine cultures. *Escherichia coli (E. coli)* was the most isolated (62%) pathogen. Among gram-negative bacteria, *E. coli* was followed by *Klebsiella species* (15.5%), *Pseudomonas aeruginosa* (5.17%), and *Enterobacter species* (3.45%). Among gram-positive bacteria, *Enterococcus faecalis species* (8.62%) were the most common, followed by *Acinetobacter* (1.72%) and *Staphylococcus species* (1.72%).

Table 2: Prevalence of pathogens isolated on urine culture (n=58)

Name of Pathogens		Number (n=58)	Percentage (%)
Gram-negative	E. Coli	36	62.07%
	Klebsiella species	9	15.52%
	Pseudomonas aeruginosa	3	5.17%
	Enterobacter species	2	3.45%
	Proteus species	1	1.72%
Gram-positive	Enterococcus faecalis species	5	8.63%
	Staphylococcus species	1	1.72%
	Acinetobacter	1	1.72%

Table 3 presents the antibiotic sensitivity pattern of isolates among 58 confirmed UTI cases. We found that nitrofurantoin was highly sensitive in almost all cases (97%), followed by ciprofloxacin, which was sensitive in 93% of cases. The next most sensitive antibiotics were amikacin (88%), gentamycin (74%), and levofloxacin (66%). On the other hand, we found that uropathogens were highly resistant to cefixime (97%),

cotrimoxazole (81%), amoxicillin (72%), aztreonam (72%), and ceftriaxone (67%).

Table 3: Antibiotic sensitivity pattern of isolates (n=58)

	Name of antibiotics	Sensitivity		Intermediate sensitivity		Resistant		Not done
		n	%	n	%	n	%	n
1	Amikacin	51	88	1	1.72	6	10.34	0
2	Amoxycillin	3	5.17	0	0	42	72.4	13
3	Azithromycin	17	29.3	1	1.72	35	62.0	5
4	Aztreonam	8	13.8	2	3.44	42	72.4	6
5	Ciprofloxacin	54	93	2	3.44	2	3.44	0
6	Cotrimoxazole	9	15.52	1	1.72	47	81.03	1
7	Cloxacin	7	12	0	0	2	3.44	49
8	Ceftriaxone	16	27.6	3	5.17	39	67.24	0
9	Cefixime	0	0	0	0	56	96.6	2
10	Cefuroxime	0	0	2	3.44	53	1.37	3
11	Cephalexin	26	44.83	0	0	12	20.7	20
12	Ceftazidime	1	1.72	0	0	10	17.24	47
13	Colistin	7	12	2	3.44	15	25.86	34
14	Erythromycin	16	27.6	1	1.72	4	6.89	37
15	Gentamicin	43	74	2	3.44	13	22.4	0
16	Imipenem	17	29.3	2	3.44	18	31.03	21
17	Levofloxacin	38	65.6	1	1.72	16	27.6	3
18	Meropenem	33	56.9	2	3.44	17	29.3	6
19	Netilmicin	13	22.4	0	0	23	39.66	22
20	Nalidixic acid	29	50	2	3.44	21	36.20	6
21	Nitrofurantoin	56	96.56	0	0	2	3.44	0
22	Penicillin	3	5.17	1	1.72	16	27.6	38
23	Vancomycin	5	8.62	0	0	0	0	53

Table 4 presents the detailed antibiotic sensitivity pattern of isolates by different types of bacteria, where we found that *E. coli* was highly sensitive (100%) to nitrofurantoin and highly resistant (100%) to amoxicillin and cefixime. *Klebsiella species* were highly sensitive (100%) to ciprofloxacin, gentamycin, levofloxacin, and nitrofurantoin and highly resistant (100%) to azithromycin, cotrimoxazole, ceftriaxone, cefixime, and cefuroxime. *Pseudomonas* isolates were highly sensitive (100%) to ciprofloxacin and levofloxacin and highly resistant (100%) to cotrimoxazole, cephalosporin group, and nalidixic acid. *Enterobacter species* were highly sensitive (100%) to aztreonam, ciprofloxacin, cotrimoxazole, cephalexin, gentamicin, and nitrofurantoin and highly resistant (100%) to amoxicillin. *Proteus species* were highly sensitive (100%) to amikacin, azithromycin, ciprofloxacin, cotrimoxazole, ceftriaxone, levofloxacin, meropenem, nitrofurantoin, and vancomycin; they were extremely resistant (100%) to amoxycillin, aztreonam, cefixime, cephalexin, cephalexin, cephradine, ceftazidime, colistin, gentamycin, imipenem, netilmicin, nalidixic acid, and penicillin.

Table 4: Antibiotic sensitivity pattern of isolates by distinct types of bacteria (n=58)

	Gram-Positive bacteria					Gram-Negative bacteria		
Antibiotics Sensitivity	E coli	Klebsiella	Pseudomonas	Enterobacter spp.	Proteus	Enterococcus	Acinetobacter	Staphylococcus spp
	(n=36)	(n=9)	(n=3)	(n=2)	(n=1)	(n=5)	(n=1)	(n=1)
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Amikacin	S: 34 (94.45%) I:0 R:2 (5.56%)	S:7 (77.78%) I:1(11.11%) R:1(11.11%)	S:2 (66.7%) I:0 R:1(33.3%)	S:1 (50%) I:0 R:1 (50%)	S:1(100%) I:0 R:0	S:4 (80%) I:0 R:1(20%)	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Amoxycillin	S:0 I:0 R:36 (100%)	ND	ND	S:0 I:0 R:2 (100%)	S:0 I:0 R:1(100%)	S:3 (60%) I:0 R:2 (40%)	ND	S:0 I:0 R:1 (100%)
Azithromycin	S:12 (33.33%)	S:0 I: 0	S:2 (66.7%) I:0	S:1(50%) I:0	S:1(100%)	ND	S:1 (100%) I:0	S:0 I:1 (100%)

	I:0 R:24 (66.7%)	R:9 (100%)	R:1(33.3%)	R:1(50%)	I:0 R:0		R:0	R:0
Aztreonam	S:3 (8.3%) I:2 (5.56%) R:31(86.1%)	S:2 (22.2%) I:0 R:7 (77.8%)	S:1(33.3%) I:0 R:2 (66.7%)	S:2 (100%) I:0 R:0	S:0 I:0 R:1(100%)	ND	S:0 I:0 R:1 (100%)	ND
Ciprofloxacin	S:33(91.7%) I:1 (2.78%) R:2(5.56%)	S:9 (100%) I:0 R:0	S:3 (100%) I:0 R:2 (66.7%)	S:2 (100%) I:0 R:0	S:1(100%) I:0 R:0	S:4 (80%) I:1 (20%) R:0	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Cotrimoxazole	S:1(2.78%) I:1(2.78%) R:34 (94.44%)	S:0 I:0 R:9 (100%)	S:0 I:0 R:3 (100%)	S:2 (100%) I:0 R:0	S:1(100%) I:0 R:0	S:4 (80%) I:0 R:1 (20%)	ND	S:1 (100%) I:0 R:0
Cloxacin	S:4 (11.11%) ND 32	ND	ND	ND	ND	S:3 (60%) I:0 R:2 (40%)	ND	ND
Ceftriaxone	S:12 (33.33%) I:2(5.56%) R:22 (61.11%)	S:0 I:0 R:9 (100%)	S:0 I:0 R:3 (100%)	S:1(50%) I:0 R:1 (50%)	S:1(100%) I:0 R:0	S:1 (20%) I:0 R:4 (80%)	S:1 (100%) I:0 R:0	S:0 I:1 (100%) R:0
Cefixime	S:0 I:0 R:36 (100%)	S:0 I:0 R:9 (100%)	S:0 I:0 R:3 (100%)	ND	S:0 I:0 R:1 (100%)	S:0 I:0 R:5 (100%)	S:0 I:0 R:1 (100%)	S:0 I:0 R:1 (100%)
Cefuroxime	S:0 I:2 (5.56%) R:34 (94.44%)	S:0 I:0 R:9 (100%)	S:0 I:0 R:3 (100%)	ND	ND	S:0 I:0 R:5 (100%)	S:0 I:0 R:1 (100%)	S:0 I:0 R:1 (100%)
Cephalexin	S:22 (61.11%) I:0 R:4 (11.11%) ND 10	ND	S:0 I:0 R:3 (100%)	S:2(100%) I:0 R:0	S:0 I:0 R:1(100%)	S:2 (40%) I:0 R:2 (40%) ND 1	S:0 I:0 R:1(100%)	S:0 I: 0 R:1 (100%)
Cephradine	ND	ND	S:0 I:0 R:3 (100%)	S:0 I:0 R:1(50%) ND:1	S:0 I:0 R:1(100%)	ND	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Ceftazidime	ND	ND	S:0 I:0 R:3 (100%)	ND	S:0 I:0 R:1(100%)	S:0 I:0 R:5 (100%)	S:1 (100%) I:0 R:0	S:0 I:0 R:1(100%)
Colistin	S:3 (8.33%) I:0 R:10 (27.78%) ND 23	ND	S:1 (33.3%) I:0 R:2 (66.7%)	ND	S:0 I:0 R:1(100%)	S:1 (20%) I:2 (40%) R:2 (40%)	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Erythromycin	S:12 (33.33%) I:0 R:0 ND: 20	ND	ND	S:1 (50%) I:0 R:1 (50%)	ND	S:2 (40%) I:1 (20%) R:2 (40%)	ND	S:1 (100%) I:0 R:0
Gentamicin	S:24 (66.67%) I:2 (5.56%) R:12 (33.33%)	S:9 (100%) I:0 R:0	S:2 (66.7%) I:0 R:1 (33.3%)	S:2 (100%) I:0 R:0	S:0 I:0 R:1(100%)	S:4 (80%) I:0 R:1 (20%)	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Imipenem	S:10 (27.78%) I:0 R:5 (13.89%) ND 21	S:1 (11.11%) I:0 R:8 (88.89%)	S:1(33.3%) I:0 R:2 (66.7%)	ND	S:0 I:0 R:1(100%)	S:3 (60%) I:0 R:2 (40%)	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Levofloxacin	S:20 (55.56%) I:1(2.78%) R:15 (41.67%)	S:9 (100%) I:0 R:0	S:3 (100%) I:0 R:0	ND	S:1(100%) I:0 R:0	S:3 (60%) I:0 R:1 (20%) ND 1	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0

Meropenem	S:20 (55.56%) I:2 (5.56%) R:14	S:5 (55.6%) I: 0 R:0 ND:4	S:2 (66.7%) I:0 R:1(33.3%)	ND	S:1(100%) I:0 R:0	S:4 (80%) I:0 R:1(20%)	S:0 I:0 R:1(100%)	S:1 (100%) I:0 R:0
Netilmicin	S:6 (16.7%) I:0 R:13 (36.11%) ND17	S:1(11.11%) I:0 R:5 (55.6%) ND:3	S:1 (33.3%) I:0 R:2 (66.7%)	ND	S:0 I:0 R:1 (100%)	S:3 (60%) I:0 R:2 (40%)	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0
Nalidixic acid	S:22 (61.1%) I:2 (5.56%) R:12 (33.33%)	S:5 (55.6%) I:0 R:4 (44.4%)	S:0 I:0 R:3 (100%)	S:1 (50%) I:0 R:1 (50%)	S:0 I:0 R:1(100%)	ND	ND	S:1 (100%) I:0 R:0
Nitrofurantoin	S:36 (100%) I:0 R:0	S:9 (100%) I:0 R:0	S:1 (33.3%) I:0 R:2 (66.7%)	S:2 (100%) I:0 R:0	S:1(100%) I:0 R:0	S: 5 (100%) I:0 R:0	S: 1(100%) I:0 R:0	S:1 (100%) I:0 R:0
Penicillin	S: 0 I:2 (5.56%) R:14 (38.9%) ND:20	ND	ND	S:0 I:1(50%) R:1(50%)	S:0 I:0 R:1(100%)	S:3 (60%) I:1 (20%) R:1(20%)	ND	S:1 (100%) I:0 R:0
Vancomycin	ND	ND	ND	ND	S:1(100%) I:0 R:0	S:4 (80%) I:0 R:1(20%)	S:1 (100%) I:0 R:0	S:1 (100%) I:0 R:0

NB Name of antibiotics is listed alphabetically.
Here, S= sensitive, I= Intermediately sensitive, R=Resistance, 0 = no result
ND = not done

Regarding gram-positive bacteria, *Enterococcus faecalis species* were found to be extremely sensitive (100%) to nitrofurantoin and enormously resistant (100%) to cefixime, cefuroxime, and ceftazidime. The *Acinetobacter* isolate was found to be extremely sensitive (100%) to amikacin, azithromycin, ciprofloxacin, ceftriaxone, cephradine, ceftazidime, colistin, gentamicin, imipenem, levofloxacin, netilmicin, nitrofurantoin, and vancomycin; it was highly resistant (100%) to aztreonam, cefixime, cefuroxime, cephalexin, and meropenem. Staphylococcus species were extremely sensitive (100%) to amikacin, ciprofloxacin, cotrimoxazole, cephradine, colistin, erythromycin, gentamicin, imipenem, levofloxacin, meropenem, netilmicin, nalidixic acid, nitrofurantoin, penicillin, and vancomycin; they were enormously resistant (100%) to amoxycillin, cefixime, cefuroxime, cephalexin, and ceftazidime.

Out of 23 antibiotics, we found that the most effective antibiotics were nitrofurantoin, which was highly sensitive (100%) to seven out of eight bacteria (E. coli, Klebsiella, Enterobacter species, Proteus, Enterococcus, Acinetobacter, and Staphylococcus species), followed by ciprofloxacin, which was highly sensitive (100%) to six out of eight bacteria (*Klebsiella, Pseudomonas, Enterobacter species, Proteus, Acinetobacter, and Staphylococcus species*). Levofloxacin was highly sensitive (100%) to five out of eight bacteria (*Klebsiella, Pseudomonas, Proteus, Acinetobacter, and Staphylococcus species*), and gentamicin was highly sensitive (100%) to four out of eight bacteria (*Klebsiella, Enterobacter species, Acinetobacter, and Staphylococcus species*). However, gentamicin is highly resistant (100%) to *Proteus*.

Three antibiotics were highly sensitive (100%) to three bacteria: vancomycin (sensitive to *Proteus, Acinetobacter, and Staphylococcus species*), cotrimoxazole (sensitive to *Enterobacter species, Proteus, and Staphylococcus species*), and amikacin (sensitive to *Proteus, Acinetobacter, and Staphylococcus species*). However, Klebsiella and Pseudomonas were highly resistant (100%) to *cotrimoxazole*.

On the other hand, we found that the most resistant antibiotics were cefixime (highly resistant [100%] against seven bacteria: *E. coli, Klebsiella, Pseudomonas, Proteus, Enterococcus, Acinetobacter, and Staphylococcus species*); however, we did not conduct an antibiotic sensitivity test on *Enterobacter species* or cefuroxime (highly resistant [100%] against five bacteria: *Klebsiella, Pseudomonas, Enterococcus, Acinetobacter, and Staphylococcusspecies*), although we did not conduct an antibiotic sensitivity test on *Enterobacter species and Proteus*.

We also found that amoxycillin was highly resistant (100%) against four bacteria, *E. coli, Enterobacter species, Proteus, and Staphylococcus species*, although we did not conduct an antibiotic sensitivity test on *Klebsiella, Pseudomonas, and Acinetobacter*, and cephalexin was highly resistant (100%) against four bacteria, *Pseudomonas, Proteus, Acinetobacter, and Staphylococcus species*, although we did not conduct an antibiotic sensitivity test on

Klebsiella. Cephalexin is highly (100%) sensitive only to *Enterobacter species.*

We found that ceftazidime was highly resistant (100%) against four bacteria, *Pseudomonas, Proteus, Enterococcus, and Staphylococcus species,* and highly (100%) sensitive to *Acinetobacter*, although we did not conduct an antibiotic sensitivity test on *E. coli, Klebsiella and Enterobacter species.*

IV. Discussion

Our study presents the bacteriological profile and antibiotic sensitivity patterns of urinary tract infections in children aged 12 years and below living in the northernmost part of Bangladesh. This study found that almost half (47%) of the suspected UTI study respondents (n=200) had significant pyuria. This study finding is lower than that of the studies that were conducted in other tertiary hospitals in Bangladesh, such as 92% in Mymensingh Medical College under the Dhaka division (Islam et al., 2010), 79% in Dhaka Shishu Hospital, Dhaka (Islam et al., 2019), and 67% in Combined Military Hospital, Dhaka (Nazme et al., 2017). This difference is because most patients prefer to visit tertiary hospitals located in the Dhaka division due to the high quality of services and the presence of skilled and efficient healthcare professionals. The prevalence of pyuria among children is also higher in other Asian countries, such as Nepal (95.6%) (Singh & Madhup, 2013).

These urine samples were further processed for urine culture, where we found that 58 samples had confirmed UTIs, i.e., 29% of suspected cases and 62% of presumptive UTI cases, due to positive urine culture. This study finding varies in other studies conducted in Bangladesh and Nepal; this may be attributed to the sample size and age of study respondents. Positive urine culture varies from 32% of suspected cases with children under 15 years (Nazme et al., 2017) to 84% of suspected cases with children under 18 years (Paul et al., 2019). Both studies were conducted in two different tertiary care hospitals located in Dhaka. A similar variation was also found in Nepal, ranging from 29% to 45% (Rai et al., 2008; Singh & Madhup, 2013).

The prevalence of UTIs varies with the age and sex of children. Almost half (45%) of the culture-positive cases were found in the age group below five years. This finding could be because younger children are not toilet trained, and ascending infection with fecal flora is more common in this age group. Similar findings are also reflected in other studies conducted in tertiary hospitals (Bay & Anacleto, 2010; Nazme et al., 2017; Singh & Madhup, 2013). Regarding gender differences, several studies reported a predominance of female children over males (Akram et al., 2007; Bay & Anacleto, 2010; Gautam & Pokhrel, 2012; Shrestha et al., 2013). We also found that UTIs were 1.6 times more frequent in females. The reasons behind this might be that a female child has a short urethra, is easily contaminated with fecal matter, and is not properly cleaned up after passing urine. These results are consistent with the study findings of Islam et al. (Islam et al., 2019) and Nazme et al. (Nazme et al., 2017). However, two studies conducted in India found males to be prevalent (Rai et al., 2008; Rekha et al., 2010); this may be due to an increase in seeking treatment for male children.

In this study, *E. coli* was the most isolated (62%) uropathogen. In different studies, the percentage of *E. coli* varies from 30% to 90% (Bay & Anacleto, 2010; Islam et al., 2010; Patel & Garala, 2014; Shrestha et al., 2013). The following common organisms in our study were *Klebsiella* (15.5%), *Enterococcus* (8.6%), and *Pseudomonas* (5.2%). Nazme et al. also found *Enterococcus* and *Klebsiella*to be the most common uropathogens after *E. coli* (Nazme et al., 2017). Islam et al. found that *Klebsiella, Pseudomonas, Enterococcus, Staphylococcus aureus*, and *Proteus species* were the most common uropathogens after *E. coli* (Islam et al., 2019).

This study found that *E. coli* was highly sensitive (100%) to nitrofurantoin and highly resistant (100%) to amoxicillin and cefixime; in contrast, Shrestha et al. (Shrestha et al., 2013) and Nazme et al. (Nazme et al., 2017) found that *E. coli* was most sensitive not only to nitrofurantoin but also to ciprofloxacin, levofloxacin, and amikacin. Das et al. reported that the sensitivity of E. coli to meropenem, amikacin, colistin, azithromycin, levofloxacin, cotrimoxazole, and ampicillin was high (Das et al., 2017). The next most common uropathogen was Klebsiella. This study found that *Klebsiella species* were highly sensitive (100%) to ciprofloxacin, gentamycin, levofloxacin, and nitrofurantoin and highly resistant (100%) to azithromycin, cotrimoxazole, ceftriaxone, cefixime, and cefuroxime. An Indian study reported that Klebsiella was the most sensitive to Ofloxacin, Amikacin, and Piperacillin+Tazobactum (Patel & Garala, 2014).

We found that *Pseudomonas* isolates were highly sensitive (100%) to ciprofloxacin and levofloxacin and highly resistant (100%) to cotrimoxazole, cephalosporin, and nalidixic acid. The findings of Nazme et al. (Nazme et al., 2017) are similar to those of this study, except that they found that Pseudomonas is also highly sensitive to *amikacin*. *Enterobacter species* were highly sensitive (100%) to aztreonam, ciprofloxacin, cotrimoxazole, cephalexin, gentamicin, and nitrofurantoin and highly resistant (100%) to amoxicillin. Villegas et al. also found similar results with Enterobacter (Villegas & Quinn, 2002).

In this study, *Proteus species* were highly sensitive (100%) to amikacin, azithromycin, ciprofloxacin, cotrimoxazole, ceftriaxone, levofloxacin, meropenem, nitrofurantoin, and vancomycin; they were extremely resistant (100%) to amoxycillin, aztreonam,

cefixime, cephalexin, cephalexin, cephradine, ceftazidime, colistin, gentamycin, imipenem, netilmicin, nalidixic acid, and penicillin. A similar finding was found by Nazme et al. (Nazme et al., 2017).

Regarding gram-positive bacteria, *Enterococcus faecalis* species were found to be extremely sensitive (100%) to nitrofurantoin and enormously resistant (100%) to cefixime, cefuroxime, and ceftazidime. Nazme et al. (Nazme et al., 2017), Kauer et al. (Kaur et al., 2014), and Rossi et al. (Rossi et al., 2006) also found similar results. Our study found that the *Acinetobacter* isolate was extremely sensitive (100%) to amikacin, azithromycin, ciprofloxacin, ceftriaxone, cephradine, ceftazidime, colistin, gentamicin, imipenem, levofloxacin, netilmicin, nitrofurantoin, and vancomycin; it was highly resistant (100%) to aztreonam, cefixime, cefuroxime, cephalexin, and meropenem. This study's findings are similar to those of Nazme et al. (Nazme et al., 2017) and Urmi et al. (Urmi et al., 2019). *Staphylococcus species* were extremely sensitive (100%) to amikacin, ciprofloxacin, cotrimoxazole, cephradine, colistin, erythromycin, gentamicin, imipenem, levofloxacin, meropenem, netilmicin, nalidixic acid, nitrofurantoin, penicillin, and vancomycin; they were enormously resistant (100%) to amoxycillin, cefixime, cefuroxime, cephalexin, and ceftazidime. Shrestha et al. (Shrestha et al., 2013), Sorlozano et al.(Sorlózano-Puerto et al., 2017), and Baral et al. (Baral et al., 2012) also found similar study findings.

Nitrofurantoin is also recommended as the first choice among oral antibiotics for prophylaxis and treatment of UTIs in children due to its higher sensitivity (Laila et al., 2012; Randrianirina et al., 2007; Sanchez et al., 2014; Shrestha et al., 2013), and ciprofloxacin is a widely used fluoroquinolone with high bacterial activity against uropathogens irrespective of gram-negative or gram-positive group and well-established clinical efficacy in the treatment of UTIs (Belete et al., 2019; Blondeau, 2004). Our study also found that the most effective antibiotics are nitrofurantoin, which is highly sensitive (100%) to seven out of eight bacteria except for *Pseudomonas*, followed by ciprofloxacin, which is highly sensitive (100%) to six out of eight bacteria except for *E. coli and Enterococcus.*

Compared to another study conducted in Bangladesh (Nazme et al., 2017), this study found that levofloxacin was highly sensitive (100%) to five out of eight bacteria except for *E. coli and Enterococcus;* however, the sensitivity test was not performed on *Enterobacter.* Gentamicin was highly sensitive (100%) to four out of eight bacteria except for *E. coli, Pseudomonas, Enterococcus, and Proteus*, and a similar study finding was noticed in Yuksel et al.(Yüksel et al., 2006).

On the other hand, we found that the most resistant antibiotics were cefixime (highly resistant [100%] against seven bacteria: *E. coli, Klebsiella, Pseudomonas, Proteus, Enterococcus, Acinetobacter, and Staphylococcus species)*; however, we did not conduct an antibiotic sensitivity test on *Enterobacter species* or cefuroxime (highly resistant [100%] against five bacteria: *Klebsiella, Pseudomonas, Enterococcus, Acinetobacter, and Staphylococcus species*), although we did not conduct an antibiotic sensitivity test on *Enterobacter species and Proteus*. This high resistance profile was also confirmed by other studies (Ibeneme et al., 2014; Patel & Garala, 2014; Shrestha et al., 2013).

V. Conclusion

Our study concluded that pediatricians working in Bangladesh's northernmost regions should be cautious when treating and managing UTIs among children. Instead of prescribing amoxicillin and cephalosporin groups of drugs that are highly resistant to uropathogens, they should prescribe nitrofurantoin and ciprofloxacin as the most appropriate antibiotics for preventing long-term complications from UTIs.

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Authors' Contributions: All authors (KN, ARH, and NKJ) contributed to the conceptualization of the study and research design. KN was involved in the methodology, mainly in data collection and statistical analysis. KN also completed the original draft writing, and ARH and NKJ reviewed and edited the writing. All authors approved the final version of the manuscript.

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Data availability: All the data that were collected during this study are presented in the paper.

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The Role of Predictors in the Development of Arrhythmia and Cardiac Conduction Disorders in Highly Qualified Football Players

By Nozimakhon U. Agzamkhodzhaeva, Iskandar R. Mavlyanov & Rano K.Islamova

Abstract- *Purpose of the study:* To assess the degree of adaptation of the cardiovascular system to increased physical activity in professional football players with heart rhythm disturbances.

Material and methods: 138 players were observed, who performed for 6 professional football clubs of the major league, with the help of clinical, instrumental and functional methods of research of the cardiovascular system.

Results: Analysis of the results of ECG showed that 24.6% of football players had a normal ECG. In 53.6% observed "benign arrhythmia" in the form of sinus bradycardia, slowing conduction along the right branch of the His bundle, sinus arrhythmia, pacemaker migration within the sinus node and 1st degree atrioventricular (AV) block.

Keywords: *heart rhythm disturbances; physical performance in athletes; maximum oxygen consumption; adaptation to physical activity.*

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The Role of Predictors in the Development of Arrhythmia and Cardiac Conduction Disorders in Highly Qualified Football Players

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Results: Analysis of the results of ECG showed that 24.6% of football players had a normal ECG. In 53.6% observed "benign arrhythmia" in the form of sinus bradycardia, slowing conduction along the right branch of the His bundle, sinus arrhythmia, pacemaker migration within the sinus node and 1st degree atrioventricular (AV) block. In 21.8% has "potentially dangerous" rhythm disturbances in the form of extrasystole, changes in the QT interval and complete blockade of the bundle branch. The PWC_{170}indicator in the group of football players with "potentially dangerous" rhythm disturbances was significantly ($P<0.05$) lower than in football players with "benign" rhythm disturbances and football players with normal ECG. A similar trend was observed in the minimal inhibitory concentration (MIC).

Conclusion: The presence of "benign heart rhythm disturbances" in football players is an indicator of a high level of physiological adaptation of the cardiovascular system of athletes to increased physical activity.

Keywords: heart rhythm disturbances; physical performance in athletes; maximum oxygen consumption; adaptation to physical activity.

I. Introduction

According to various studies, in professional athletes, ECG changes during chronic overstrain of the cardiovascular system, requiring an in-depth examination of a cardiologist, account for up to 40%, while in people who go in for sports only periodically - 12% [1,2]. Modern standards in the interpretation of ECG in athletes. It should provide for the determination of changes in indicators both in relation to the healthy part of the general population and in relation to the ECG indicators in athletes, which are defined as the norm and reflect the physiological adaptation to physical activity [3].

During routine examinations, professional athletes often reveal electrocardiographic and hemodynamic disorders, which can be both a consequence of maladjustment processes and a consequence of organic cardiological pathology [4].

In this regard, it is of interest to comprehensively analyze heart rhythm disturbances in highly qualified athletes and to determine the patterns of their development along with their influence on the general physical characteristics of athletes.

Purpose of the study: To assess the indicators of adaptation of the cardiovascular system to increased physical activity in professional football players with heart rhythm disturbances.

II. Material and Research Methods

The study was conducted on the basis of the Republican Scientific and Practical Center for Sports Medicine from 2019 to 2022. In total, 138 football players were surveyed, playing for 6 professional football clubs of the highest league of the Republic of Uzbekistan. The age of the athletes at the time of the study was 18 - 37 years old, and the sports experience was 5-15 years (the experience of sports activity took into account only performances for a professional club) years.

Exclusion criteria from the study:

- Acute and exacerbation of chronic diseases at the time of the study;
- Taking any medications.

The following methods were used to examine the footballer: collection and analysis of anamnestic data; electrocardiography (ECG); veloergometry (VEM); determination of physical work ability according to the PWC_{170}/Kr test; determination of the value of the maximum oxygen consumption (MOC).

Physical performance was assessed using the PWC_{170} submaximal test and its modified version - the PWCAF test according to V.L. Karpman et al. (1988) [7], adapted for people of different ages. The calculation of

Author α: PhD, cardiologist of the Republican Scientific and Practical Center for Sports Medicine, Tashkent, Uzbekistan.
e-mail: author.uzb@mail.ru
Author σ: MD, PhD, Professor, Scientific Advisor of the director of the Republican Scientific and Practical Center for Sports Medicine, Tashkent, Uzbekistan.
Author ρ: Researcher, Republican Scientific and Practical Center for Sports Medicine, Tashkent, Uzbekistan.

the MPC was also carried out using the formulas proposed by Karpman for the value of PWC_{170}.

Statistical processing of the results was carried out using the standard MS Office 2019 software package.

III. Results

When analyzing the ECG results of 138 professional football players, numerous changes were found that can be regarded as relatively safe and do not require specific treatment. The percentage of football players who had an absolutely normal ECG at rest, according to all generally accepted criteria, was relatively low - 24.6% (34 athletes). Among this group of football players, no pathological changes in the ECG were noted in the process of stress testing.

The largest proportion of the surveyed football players had ECG changes, which are not considered the norm in the general population, but occur with a fairly high frequency in professional athletes. They are typical (frequent or "benign") signs for athletes that do not require additional examination and treatment in the absence of complaints and signs of organic heart damage [6]. These include sinus bradycardia (heart rate less than 55 beats/min), deceleration of conduction along the right bundle branch, severe sinus arrhythmia, pacemaker migration within the sinus node, and 1st degree AV block. The number of football players who had at least one of these conditions was 74 (53.6%) out of 138.

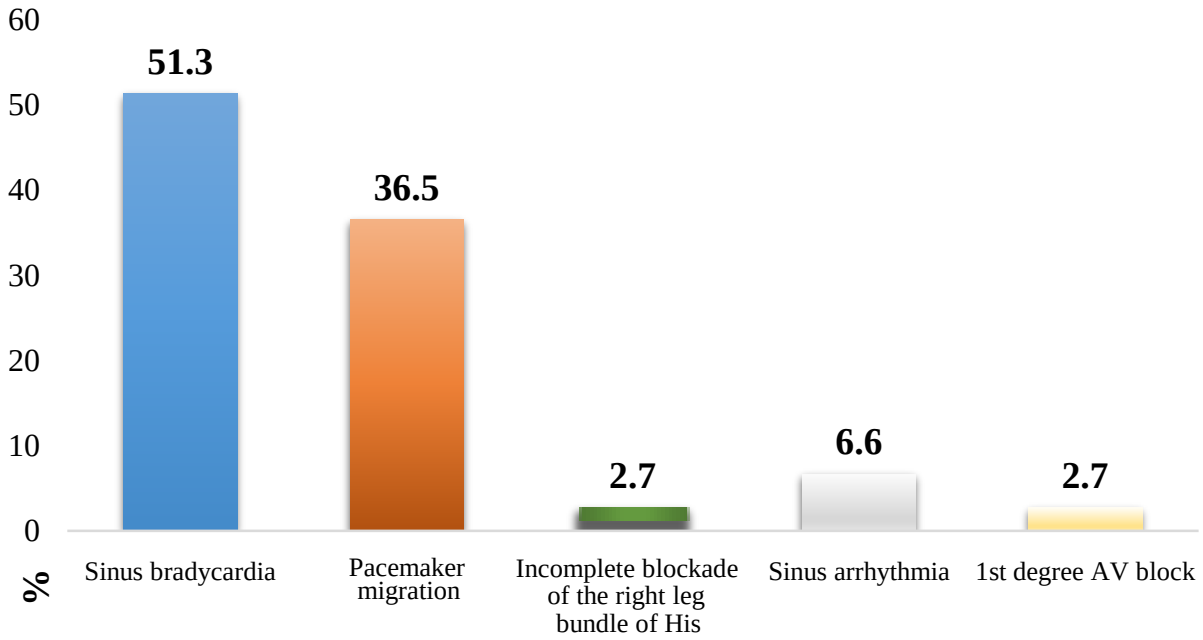

Figure 1: Distribution of "benign" rhythm disturbances.

The distribution of "benign" rhythm disturbances is shown in Figure 1. The graph shows that in the greatest number of cases, sinus bradycardia was determined - 51.3%. Pacemaker migration ranked second in frequency of occurrence and occurred in 36.5% of football players. Other types of rhythm disturbances were much less common, sinus arrhythmia - in 6.6%, and incomplete right bundle branch block and 1st degree AV block - in 2.7% of cases each.

The number of football players with identified "potentially dangerous" [6] heart rhythm disorders was 30 subjects (21.8%). The distribution of rhythm disturbances is shown in Figure 2.

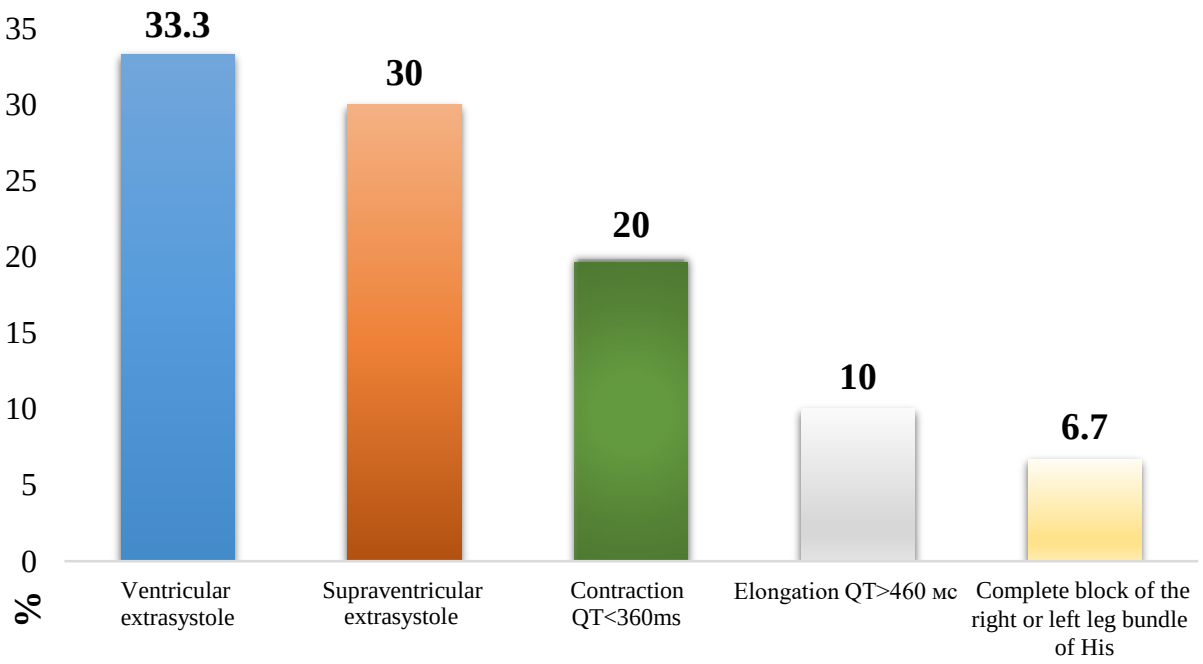

Figure 2: Distribution of "potentially dangerous" rhythm disturbances.

The graph shows that supraventricular and ventricular extrasystoles were most often detected in this group of athletes, in 30% and 33.3% of cases, respectively. All patients, in whom ES was detected at resting ECG, underwent further more in-depth examination during the day. As a result, it was revealed that 40% of footballers have premature ventricular contraction (PVC) corresponding to grade 1 according to Lown, while 50% of them have PVC corresponding to grade 2, and 10% - to grade 3. In athletes with Supraventricular arrhythmia (SVA), single extrasystole (ES) prevailed (44.4%), paired ones were found in 2 athletes (22.2%), in all other cases, allorrhythmia was determined by the type of tri- and quadrheminia.

The results of assessing the general physical performance and maximum oxygen consumption (MOC) in the football players we examined are presented in Table 1. The results showed that the PWC_{170} index in the group of "potentially dangerous" heart rhythm disturbances was significantly ($P < 0.05$) lower than in football players with "benign" heart rhythm disturbances and in the group with normal ECG. In turn, the indicators of athletes with "benign" rhythm disturbances were also significantly higher than those of athletes with a normal ECG. A similar trend was observed in the MOC. The lowest average MOC values - 48.3±1.64 ml/min/kg were observed in football players with "potentially dangerous" rhythm disturbances.

Table 1: Physical performance and MOC in football players in the study groups

	Group with "potentially dangerous" heart rhythm disorders n = 30	Group with "benign" rhythm disturbances n = 74	Group with normal ECG n = 34
PWC_{170} (kgm/min/kg)	16.75 ± 0.45 * ^	19.9 ± 1.42 *	18.2 ± 1.38
MOC (ml/min/kg)	48.3 ± 1.64 * ^	57.64 ± 2.42 *	53.46 ± 1.82

** - differences in comparison with the indices of the group with normal ECG are statistically significant (P<0.05);*
^ - differences compared to those of the group with "benign" rhythm disturbances are statistically significant (P<0.05)

IV. Discussion

Heart rate variability under conditions of adaptation of the body to tense muscular activity is a manifestation of the physiological mechanism of mobilization of the functional reserves of the heart. An increase in the functional reserve during adaptation of the body to continuous muscular activity occurs in 2 ways: by increasing the reserve level during urgent adaptation and as a result of long-term adaptation, which is characterized by a decrease in the initial level of functioning. Mobilization of functional reserves of urgent adaptation to physical activity is characterized by a period of functional stress [5,6. 7].

The process of mobilization of functional reserves with increased muscular activity has a direct

dependence on the level of functioning of the body, and inverse dependence on the level of mobilization of functional reserves. The decrease in heart rate variability characterizes the degree of increased mobilization of the body's functional reserves. The independent development of cardiac arrhythmias without the presence of certain diseases may be associated with an abnormal location of the pathways in the heart, which can be manifested by the presence of additional pathways and the peculiarities of the sensitivity of pacemaker cells to adrenergic influences [8,9,10].

Thus, according to the concept proposed above, the results of the studies carried out can be explained by the fact that more significant heart rhythm disturbances in the group with “potentially dangerous” rhythm disturbances are a manifestation of maladjustment of the football player's body to physical activity, which is confirmed by reduced indicators of physical workability and aerobic performance (MOC). "Benign" ECG abnormalities, in turn, are a manifestation of an increase in the body's adaptation to increased physical activity in athletes with "benign" rhythm disturbances, which was confirmed by the highest indices of physical performance and aerobic performance (MOC).

V. Conclusion

Thus, on the basis of functional tests of veloergometry (VEM), it was found that a group of football players with potentially dangerous rhythm disturbances showed a statistically significant decrease in physical performance and MOC. The presence of “benign heart rhythm disturbances” in football players is an indicator of a high level of physiological adaptation of the cardiovascular system of athletes to increased physical activity.

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Agreement between Diaphragm Ultrasound and Pulmonary Function Testing in the Evaluation of Diaphragm Function in Patients with ALS

By F. Viccaro, L. D'Antoni, F. Vassalli, A. Sotgiu, K. R. Flores, E. M. Di Biase & P. Palange

Sapienza University of Rome

Abstract- *Background:* In ALS patients, diaphragmatic dysfunction is usually assessed by pulmonary function testing (PFTs) that requires patient cooperation. Evidence suggest that diaphragm ultrasound (DU) can be utilized, as an alternative to PFTs, to detect reduced diaphragmatic motility in ALS patients. This study aimed to verify the agreement between the results obtained by DU with those obtained by PFTs in both standing-up and supine positions.

Methods: Twenty nine spinal ALS and thirteen healthy controls were studied in standing up and lying 30° supine position. All subjects performed PFTs and DU, to assess of diaphragmatic excursion, delta-thickness between end inspiration and end expiration (ΔT), and the thickening fraction (TF).

Keywords: *amyotrophic lateral sclerosis; diaphragm ultrasound; pulmonary function testing.*

GJMR-F Classification: *LCC: RC346*

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Methods: Twenty nine spinal ALS and thirteen healthy controls were studied in standing up and lying 30° supine position. All subjects performed PFTs and DU, to assess of diaphragmatic excursion, delta-thickness between end inspiration and end expiration (ΔT), and the thickening fraction (TF).

Results: The standing position, ΔT correlates with VC (r=0.58p=0.001) and FVC (r=0.61 p<0.001); in lying 30° supine position, ΔT correlates with VC(r=0.59 p=0.001) and FVC (r=0.62 p<0.001). In standing up position, TF correlates with VC (r=0.55 p=0.003) and FVC (r=0.53 p=0.005); in lying 30° supine position, TF correlates with VC (r=0.55 p=0.003) and FVC (r=0.51 p=0.007). The following correlations were also observed: the standing position, diaphragmatic excursion correlated with VC(r=0.55 p=0.007) and FVC (r =0.65 p<0.001). In lying 30° supine position, diaphragmatic excursion correlated with VC(r=0.59 p=0.003); and FVC(r=0.63 p=0.001).

Conclusion: DU adequately assesses the diaphragmatic impairment in ALS patients. Thickening and excursion appear as complementary indices in the evaluation of diaphragm motility.

Keywords: amyotrophic lateral sclerosis; diaphragm ultrasound; pulmonary function testing.

I. Introduction

Amyotrophic Lateral Sclerosis (ALS) is a neurodegenerative disease characterized by loss of both upper and lower motor neurons with progressive muscle weakness. In the late stage of the disease, respiratory muscle weakness ensues, leading to hypercapnic respiratory failure, representing the most common cause of death in these patients. The condition has no definitive treatment, and its progression can be only partly modified by pharmacological intervention; when respiratory muscle involvement occurs, the only approach that has demonstrated an improvement in survival time and quality of life is the use of non-invasive ventilation (NIV). Early recognition of diaphragm dysfunction and respiratory muscle weakness is crucial to define the optimal timing for starting NIV [1–3]. The European Federation of Neurological Societies (EFNS) guidelines recommend initiating NIV when at least one respiratory clinical symptom plus forced vital capacity (FVC)<80% of the predicted value[4]. However, the PFTs, which represent the most common and validated parameter to assess the respiratory volumes and the need for NIV, are challenging to perform in this subset of patients, because they require cooperation with the examiner and coordination during the maneuvers. On the other, diaphragmatic ultrasound (DU) is a non-invasive, radiation-free technique to assess the diaphragm function regarding of inspiratory displacement and thickening[5]. Hence, DU could provide clinically relevant information to detect patients at risk of diaphragmatic dysfunction for whom starting the NIV is indicated. Limited literature is available [6–8]on the correlation between the data obtained at DU with those obtained at PFTs in the evaluation of diaphragmatic dysfunction in ALS patients. These studies, however, did not take in to consideration the changes in lung volumes induced by changes in body position observed in ASL patients. The aims of our study in ALS patients were: 1) confirm the utility of DU in assessing diaphragmatic function, and 2) evaluate the correlation between DU and PFTs measurements in both standing and supine position.

II. Methods

a) Study design and cohort

A case-control single-centre study conducted in Rome at Umberto I Hospital. During a nine months run-in period, from May 2021 to January 2022, twenty-nine ALS patients with spinal onset, and thirteen healthy controls were enrolled. The inclusion criteria were: (1) diagnosis of ALS according to El Escorial-Revised Diagnostic Criteria[9]; (2) age > 18 years old; (3) ability and collaboration to perform respiratory tests. The exclusion criteria were (1) ALS with bulbar onset,

Author α σ ω ¥ § χ: Department of Public Health and Infectious Diseases, Sapienza University of Rome, Pulmonary Division, Policlinico Umberto I Hospital, Rome, Italy. e-mail: fausta.viccaro@gmail.com
Author ρ: Obstetric Anesthesia, Department of Critical Care and Perinatal Medicine, Istituto di Ricovero e Cura a Carattere Scientifico (IRCCS) Istituto Giannina Gaslini, Genova, Italy.

because unable to correctly perform PFTs; (2) tracheostomy; (3) ventilatory support at the time of the enrolment (4) pregnancy; (5) breastfeeding (6) actual or previous lung diseases. Healthy controls were selected among age-comparable volunteers, with no biological relationship to patients. This study was conducted per the Declaration of Helsinki and Good Clinical Practice guidelines. The local ethics committee approved the study protocol0897/2021, and written informed consent was obtained from all the subjects in the study.

b) Measurements

Demographic and anthropometric variables were collected in all patients at the time of enrolment.

c) Pulmonary Function Testing (PFTs)

Lung function evaluation followed the American Thoracic Society (ATS) guidelines[10,11]. The best of at least three measurements was taken to assure reproducibility. The assessment of Vital Capacity (VC) and Forced Vital Capacity (FVC), Forced Expiratory Volume during the first second (FEV_1) was performed standing upright and lying in a 30° supine position, using the automated equipment microQuark (Cosmed).

d) Diaphragm ultrasound (DU)

DU evaluates diaphragm thickening and excursion [5,7,12]. It was assessed by the same observer during the run-in period using Biosound Esaote - AU5 Harmonic EPI, according to Sarwal et al.[13]:

1. Diaphragm thickness was evaluated both at FRC (Te) and at TLC (Ti) by using a B-Mode 7.5-10 Hertz linear probe. Te is the thickness at FRC, and Ti is the thickness at TLC. This technique measures, in a lying 30° supine position, the diaphragmatic thickness in the zone of apposition to the rib cage between the middle and posterior axillary line. These body and probe positions are utilized to detect the thicker part of the muscle and to minimize possible measurement errors[5,14–16].

   The diaphragmatic thickening is then calculated by using two different equations:

   Δ Thickness (ΔT)=Ti-Te

   and

   Thickening Fraction (TF)=[(Ti-Te/Te) x100]
2. The real-time diaphragmatic excursion of the right hemidiaphragm was evaluated using a right anterior subxiphoid approach in a lying 30° supine position during maximal inspiratory effort by M-Mode 3.5 Hertz convex probe[5,15].

e) Statistical analysis

The data are presented for two groups, ALS patients and controls (Table 1). Categorical variables are presented as a number of patients and percentage and compared between groups with a chi-square test. Numerical data are presented as mean ± standard deviation (SD) or median [interquartile range (IQR)], as appropriate. Shapiro-Wilk test was used to test the normal distribution of numerical data. Student's t-test or Wilcoxon test was used to compare numerical values between the two groups, as appropriate. The correlation between respiratory function tests and diaphragmatic ultrasonographic indices was performed using the Pearson test. A value of $p \leq 0.05$ was considered statistically significant. Receiver operating characteristic (ROC) curves were constructed to evaluate the performance of ultrasound-derived indices in predicting FVC < 80%, one of the criteria for starting NIV. The optimal cut-point was determined as the maximal value of sensitivity plus specificity. The statistical analysis was performed with R statistical software version 4.1.

III. Results

Patient characteristics, PFTs as well as ultrasound-derived indices are shown in Table 1. No significant differences in age, sex, and BMI were observed in the two groups.

Table 1: Demographic, PFTs and ultrasonography evaluation of the study population

	Spinal ALS n=29	Controls n=13	p value
Male/female n (%)	20/9 (68/32)	6/7 (46/54)	0.06
Age (year)	60 [54-72]	46 [37-68]	0.06$
BMI (Kg/m^2)	24.2± 5.2	26.3 ± 4.3	p=0.16#
FVC standing up (%)	67.5 ± 23.4	110.7 ± 12	**< 0.001#**
FVC lying 30° supine position (%)	59.4 ± 27.3	106.9 ± 13	**< 0.001#**
VC standing up(%)	71 [54-89]	108 [105-121]	**< 0.001$**
VC lying 30° supine position (%)	64 [41-73.5]	109 [99-113]	**< 0.001**
ΔFVC (%)	10[5-26.7]	4 [2-5]	**< 0.001$**
ΔVC (%)	12 [4-26]	4 [1-7]	**p=0.02$**
Diaphragmatic excursion during deep breath (mm)	52.3[32.3-62]	62.3 [54.6-70.9]	**p=0.04$**
TF%	44.5 [34.5-79]	67 [53-105]	**p=0.05$**
ΔT	0.8 [0.6-1]	1.3 [1.1-1.9]	**< 0.001$**
Ti (mm)	2.3 [2-3.2]	3.3 [2.7-4.6]	**p=0.01$**
Te (mm)	1.5 [1.3-2]	1.7 [1.6-2.2]	**p=0.05$**

ALS: Amyotrophic Lateral Sclerosis; BMI: Body Mass Index; FRC: Functional Residual Capacity; FVC: Forced Vital Capacity; PCF: Peak Cough Flow; SD: Standard Deviation; TF: Thickening Fraction; TLC: Total Lung Capacity; VC: Vital Capacity;Te: thickness at FRC; ΔT: Δ Thickeness; Ti: Thickness at TLC.
p≤ 0.05 (in bold**) indicates significant differences*
#T test expressed as mean ± SD (standard deviation)
$ Wilcoxon test expressed as median [IQR]

As expected, PFTs and DU values were significantly different between the two groups, the most striking differences being ΔT, VC and FVC in a lying 30°supine and standing up position and the changes in FVC and VC when moving from standing to the supine position (*i.e.*, three-fold greater in ALS patients).

a) Correlation between ΔT and PFTs in both ALS patients and controls

As shown in *Fig.1,* in ALS, ΔT significantly correlates with VC and FVC, in standing up (r=0.58 p=0.001; r=0.61 p<0.001) and lying 30° supine position (r=0.59 p=0.001; r=0.62 p<0.001), respectively. A weak correlation was observed in controls between ΔT with VC and FVC, in standing up and lying 30° supine position.

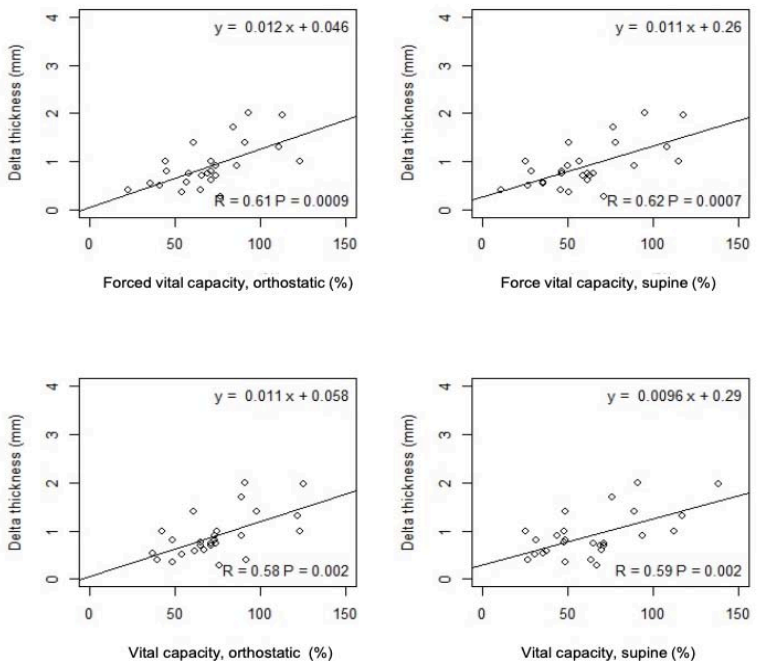

Fig.1: Correlation between ΔT and PFTs

b) Correlation between TF and PFTs in both ALS patients and controls

As shown in *Fig. 2,* in ASL patients but not in controls, TF significantly correlates with VC and with FVC in standing up (r=0.55 p=0.003; r=0.53 p=0.005) and lying 30° supine position (r=0.55 p=0.003; r=0.51 p=0.007), respectively.

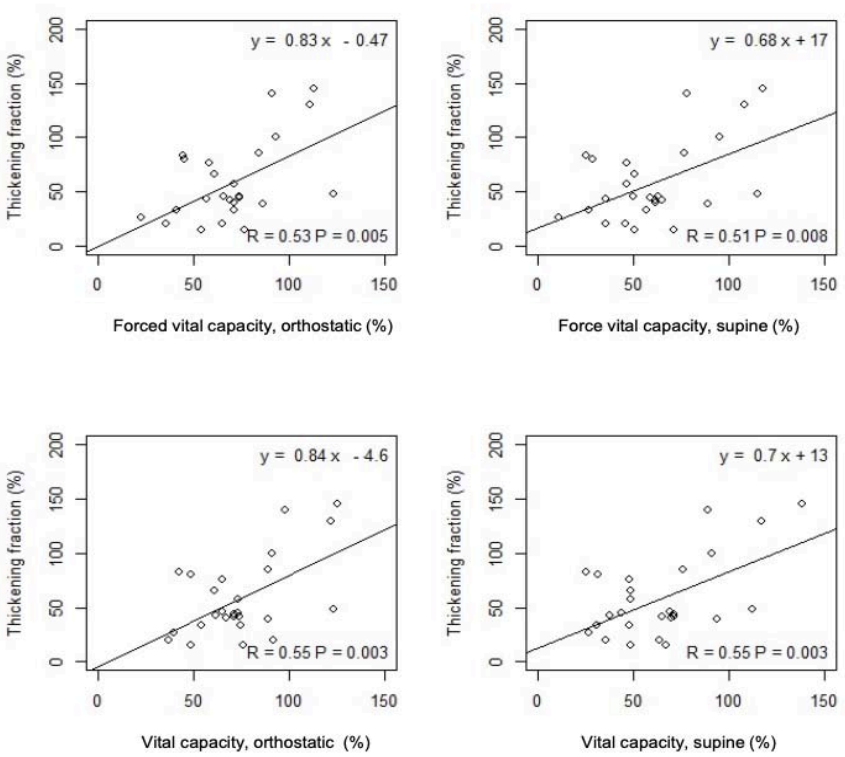

Fig. 2: Correlation between TF and PFTs

c) Correlation between diaphragmatic excursion and PFTs in both ALS patients and controls

As shown in n *Fig. 3,* in ASL patients but not in controls, DE significantly correlates with VC and FVC in standing up (r=0.55 p= 0.007; r =0.65 p<0.001) and lying 30° supine position (r=0.59 p=0.003; r=0.63 p=0.001), respectively. Moreover, in ALS patients, DE negatively correlated with the change in VC (r = -0.54 p = 0.01) and FVC from standing up to lying 30° supine position (r = -0.50 p = 0.02).

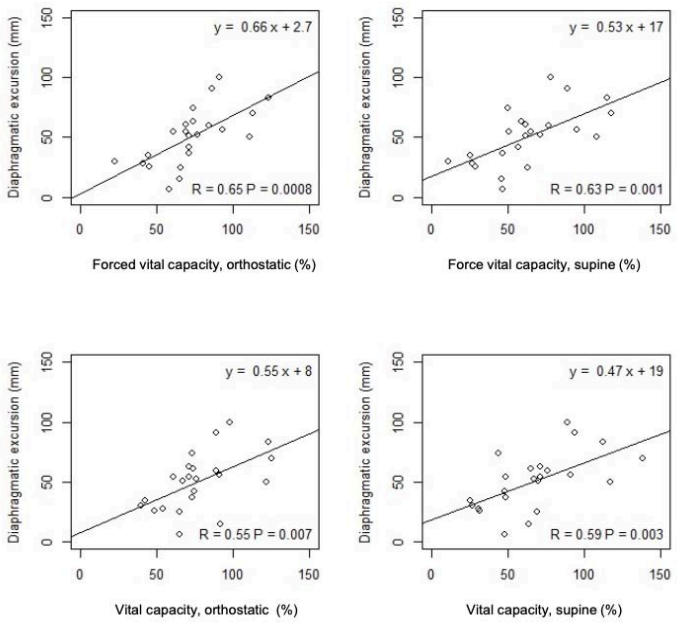

Fig. 3: Correlation between DE and PFTs

d) ROC curve analysis: predictive value of DU indices for NIV timing initiation

In our cohort, 23 out of 29 patients had a standing up FVC < 80% of predicted. As shown in *Fig.4,* in those patients, the AUC for ΔT, TF and, diaphragmatic excursion were 0.94 [0.87-1], 0.87 [0.69-1], 0.88 [0.72-1] respectively. The optimal cut-point found was 0.9 mm for ΔT, 85%for TF, and 56 mm for diaphragmatic excursion.

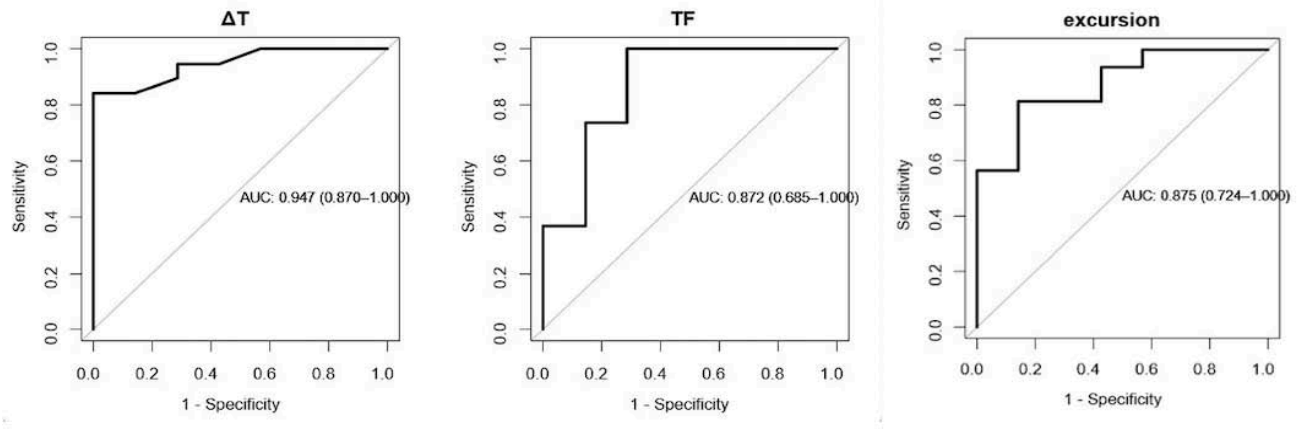

Fig. 4: ROC curve analysis: predictive value of DU indices for NIV timing initiation

IV. Discussion

Our study has demonstrated that VC and FVC measurements, in standing up and 30° lying position, correlate with ultrasonographic diaphragmatic indices for assessing diaphragmatic dysfunction in patients with ASL and, perhaps more importantly, we found that DU indices predict with good accuracy the timing for NIV initiation. Of notice, neuromuscular diseases lead to an increased elastic load, increased alveolar surface tension and stiffness of the thoracic wall causing a reduction in maximal inspiratory strength and diaphragmatic fatigue. The best way to assess the mechanical properties of the diaphragm and its ability to generate pressure is the transdiaphragmatic pressure measured by magnetic phrenic nerve stimulation with simultaneous measurements of oesophageal and gastric pressures[17]. Because of invasiveness, ΔT measurement at DU has been proposed as an alternative non-invasive approach evaluating of diaphragmatic contractile reserve[18,19]. In fact, in line with Fantini et al. [8], we postulate that ΔT might express the maximal transdiaphragmatic pressure. Specifically, ΔT cannot measure directly the pressure generated by the diaphragm shortening, but can assess how the pressure generated by a maximum inspiratory effort can short the diaphragm itself. Although not significant, maybe because of the small sample, this trend of correlation is also preserved in controls. Otherwise, in our cohort of recently diagnosed ALS patients, although TF correlates well with lung volumes in both positions, we cannot consider it an index of early diaphragmatic fatigue[16]. TF may differ based on the presentation of the disease: in acute or subacute ALS, the diaphragm may have a preserved thickness with reduced excursion due to prominent neuropathic damage[20]; on the contrary, with a more chronic course of the disease, the diaphragm becomes thin and atrophic with poor inspiratory thickening and may even become paradoxically thinner with inspiration[21]. Indeed, in our cohort, we found a reduced baseline diaphragm thickness (Te) compared to the control and, TF can vary greatly depending on the value of thickening at FRC. With this perspective, we can speculate that the role of TF is different between acute/subacute ALS, with early TF reduction and normal Te value, and chronic ALS, with a similar reduction in Ti and Te values until late stage, maintaining a normal TF value. According to our results, also Fantini et al. [16] show that TF is an index of late stage of diaphragmatic dysfunction, that is not useful for detecting early diaphragmatic dysfunction. Moreover, no significant correlation was found between TF and lung volumes in controls, because of the stability of lung volumes in both positions measured. We also have shown that diaphragmatic excursion measured during maximal inspiratory effort significantly correlates positively with all lung volumes and negatively in position changing. At the beginning of the disease, the diaphragmatic dysfunction expressed as muscle fatigue and reduced excursion, could be compensated by accessories respiratory muscle. In this way, if there is a diaphragmatic decreased capacity to generate force and reduced excursion, this is not translated into a reduction in respiratory function tests. When the disease progress in patients with ALS, the respiratory system elastic load is much higher than the muscle strength, leading to atelectasis, reduced lung elasticity, and, finally increased elastic load. Whit this scenario, there is a definitive patient deterioration with generalized muscle weakness and, finally, reduction of lung volumes. Based

on this finding, we could speculate that DU evaluation by transabdominal approach is a feasible and reproducible technique and integrate the transthoracic approach, better reflecting a direct and dynamic evaluation of this muscle, supporting physicians in an early subclinical diagnosis of diaphragmatic dysfunction in ALS patients. According to our results, Aliberti et al.[5] evaluated diaphragmatic excursion performed bedside confirming our data. Moreover, in ALS patients, the excursion is negatively correlated with the change in VC and FVC from standing up to lying 30° supine position showing, confirming that more is the change between the two positions, less is the diaphragmatic excursion. In this study, we also investigated ROC analysis of all the DU indices (ΔT, TF, Excursion) to identify the cut-off point to predict FVC lower than 80% of the predicted value, which is an indication for mechanical ventilation, following the current consensus guidelines[4,10]. Interestingly, when the ΔT is lower than 0,9 mm and the diaphragmatic excursion during a deep breath is lower than 56 mm predicts diaphragmatic dysfunction in patients who are not able or cooperative to perform respiratory functional tests, and could guide clinicians in the decision to start NIV. An important limitation of our study is the absence of a comparison between the DU measurement and the gold standard method used to assess its contractility, transdiaphragmatic pressure measured by phrenic nerve stimulation, because it was invasive and not easy to perform in routine clinical practice. Another considerable limitation is the small sample size, there was not easy to recruit vulnerable patients because of their physical and emotional frailty. Another limitation was the lack of inter and intra-variability analysis of the DU performed. Finally, the absence of solid literature references about our indices needs further research to confirm and corroborate the feasibility of our findings.

V. Conclusion

In summary, the relevance of finding out an index of early diaphragmatic dysfunction is mandatory in patients with neuromuscular diseases who cannot perform traditional lung function tests. If TF is affected by the baseline value of diaphragm thickness, the DU indices ΔT and diaphragmatic excursion are independent of this value and could provide specific information about muscle fatigue and an early diaphragmatic dysfunction before the exhausting muscle phase become clinically evident. This finding thus opens new perspectives on the use of this imaging technique in the early diagnosis and follow-up of diaphragmatic function impairment.

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Conflict of Interest: None of the authors have potential conflicts of interest to be disclosed" should appear in the paper.

Data Availability Statement: The data that support the findings are available in the Supplementary material.

Human/Animal Ethics Approval Declaration: The local ethics committee approved study protocol number 0897/2021 and written informed consent was obtained from all the subjects in the study.

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Abbreviations

ALS: Amyotrophic Lateral Sclerosis
ATS: American Thoracic Society
BMI: Body Mass Index
DU: diaphragm ultrasound
EFNS: European Federation of Neurological Societies
FEV_1: Forced Expiratory Volume during the first second
FRC: Forced Residual Capacity
FVC: Forced Vital Capacity
IQR: Intequartile Range
NIV: Non-invasive ventilation
PFTs: Pulmonary Function Testing
ROC: Receiver operating characteristic
SD: Standard Deviation
Te: thickning at FRC
TF: thickening fraction
Ti: thickening at TLC
TLC: Total Lung Capacity
VC: Vital Capacity
ΔT: delta-thickness
ΔFVC: the change in FVC from standing upright to supine position
ΔVC: the change in VC from standing upright to supine position

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Cutaneous Pseudolymphoma: A Case Report

By Carolina De Alcantara R.C.da Nave, Vítor Scalone Netto,
Victor Hugo Monfrin Torres & Sergio dos Santos Barbosa

Summary- *Objectives:* To report the case of a rare dermatological disease, demonstrating its possible clinical and immunohistochemical variations.

Methods: Information for carrying out the case report was communicated through medical records made available by Carapicuíba's General Hospital after approval by the institution's Ethics Committee and literature review.

Discussion: We report the case of a 68-year-old white man, retired, with a history of erythematous plaques and with a very itchy scalp for 6 months. Having the clinical suspicion that a cutaneous lymphoma may be involved, an incisional biopsy was performed. Histopathological analysis and subsequent immunohistochemistry showed polyclonal lymphoid dermal infiltrate, and the diagnosis of cutaneous lymphocytoma or the most common subtype of pseudolymphoma was concluded.

Keywords: *cutaneous pseudolinfoma. lymphoid hyperplasia. lymphocytoma.*

GJMR-F Classification: *NLM Code: WR 650*

Strictly as per the compliance and regulations of:

Cutaneous Pseudolymphoma: A Case Report

Pseudolinfoma Cutâneo: Um Relato De Caso

Carolina De Alcantara R.C.da Nave [α], Vítor Scalone Netto [σ], Victor Hugo Monfrin Torres [ρ] & Sergio dos Santos Barbosa [ω]

Resumo- Objetivos: Relatar o caso de uma doença dermatológica rara, demonstrando suas possíveis variações clínicas e imunohistoquímicas.

Métodos: As informações para realização do relato de caso foram obtidas através de prontuários disponibilizados pelo Hospital Geral de Carapicuíba após aprovação do Comitê de Ética da instituição e revisão da literatura.

Discussão: Relata-se o caso de um homem de 68 anos, branco, aposentado, com história de surgimento de placas eritematosas e muito pruriginosas no couro cabeludo há 6 meses. Devido a suspeita clínica que pudesse se tratar de um linfoma cutâneo foi realizada uma biópsia incisional. A análise histopatológica e posterior imuno-histoquímica evidenciou um infiltrado dérmico linfoide de padrão policlonal, sendo então fechado o diagnóstico de linfocitoma cútis o subtipo mais comum de pseudolinfoma.

Conclusão: A raridade do caso nos leva e descrevê-lo e fazer um breve resumo dos pseudolinfomas, com ênfase em sua forma mais comum (nodular). Essas doenças podem ter grandes semelhanças clínicas e histopatológicas com os linfomas, cabendo ao clínico unir dados desde a anamnese até a imuno-histoquímica para traçar uma conduta.

Descritores: pseudolinfoma cutâneo. hiperplasia linfoide. linfocitoma.

Summary- Objectives: To report the case of a rare dermatological disease, demonstrating its possible clinical and immunohistochemical variations.

Methods: Information for carrying out the case report was communicated through medical records made available by Carapicuíba's General Hospital after approval by the institution's Ethics Committee and literature review.

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Conclusion: The rarity of the case leads us to describe it and make a brief summary of pseudolinfomas, with emphasis on its most common (nodular) form. These diseases can have great similarities, clinical and histopathological with lymphomas, and it is up to the clinician to join the anamnesis data with immunohistochemistry to trace his conduct.

Keywords: cutaneous pseudolinfoma. lymphoid hyperplasia. lymphocytoma.

I. Introdução

Os termos linfomas cutâneos e pseudolinfomas são utilizados pelos estudos para se referir a um grupo heterogêneo de doenças cuja classificação passa por contínuas revisões. A diferenciação entre esses dois grupos é complexa, mas de vital importância para consequências terapêuticas.[1,2]

Pseudolinfomas cutâneos são proliferações linfoides reativas benignas e policlonais da pele, que simulam linfomas cutâneos clinicamente, histologicamente ou em ambos os aspectos, sem se enquadrar em nenhum outro diagnostico. É importante lembrar que doenças infecciosas e não infecciosas podem apresentar infiltrado linfocítico atípico, tornando sua diferenciação um desafio.[3,4,5]

O linfocitoma cútis, também chamado de hiperplasia linfoide cutânea, é o protótipo do pseudolinfoma cutâneo de células B, sendo sua variante mais comum. O presente estudo descreve a abordagem clínica de um paciente com esse diagnóstico, detalhando as etapas investigativas e terapêuticas.[2,6]

II. Metodologia

As informações para realização do relato de caso foram obtidas através de prontuários disponibilizados pelo Hospital Geral de Carapicuíba após aprovação do Comitê de Ética da instituição e revisão da literatura.

III. Relato de Caso

Paciente masculino, raça branca, 68 anos, compareceu ao ambulatório de dermatologia com queixa de prurido difuso em membros superiores e inferiores, tronco, abdome, dorso e couro cabeludo, há 9 anos. Negou fatores desencadeantes ou de melhora. Já havia realizado previamente tratamento com

Author α: Médica Generalista em São Paulo (SP), Brasil.
e-mail: carolnave1@hotmail.com
Author σ: Médico Especialista em Clínica Médica pelo Hospital Geral de Itapecerica da Serra (HGIS) - São Paulo (SP), Brasil.
Author ρ: Médico Residente de Ortopedia e Traumatologia pela Pontifícia Universidade Católica (PUC) – Sorocaba (SP), Brasil.
Author ω: Médico Dermatologista e preceptor de Dermatologia do Hospital Geral de Carapicuíba (HGC) – Carapicuíba (SP), Brasil.

corticoide tópico e anti-histamínicos, mas não obteve sucesso.

Como antecedentes apresentava hipertensão arterial e angina instável. Fazia uso de sinvastatina, enalapril e monocordil e AAS. Um ano antes do quadro dermatológico teve quadro convulsivo atribuído a neurocisticercose, fazendo uso de gabapentina e fenitoina.

Investigação laboratorial mostrou-se normal (hemograma, perfil hepático, ferritina, vitamina B12, sorologias para HIV, hepatite B e C). Levantou-se a hipótese de reação medicamentosa à fenitoína como fator causal do quadro e após discussão com neurologista optou-se pela suspensão do uso. Com a associação de Mirtazapina o quadro de prurido generalizado melhorou, porém surgiram nos últimos meses placas eritematosas muito pruriginosas no couro cabeludo.

Ao exame físico, apresentava 4 lesões em couro cabeludo, placas eritematosas, ovaladas, bem circunscritas e com aspecto infiltrado, além de escoriações (Figura 1).

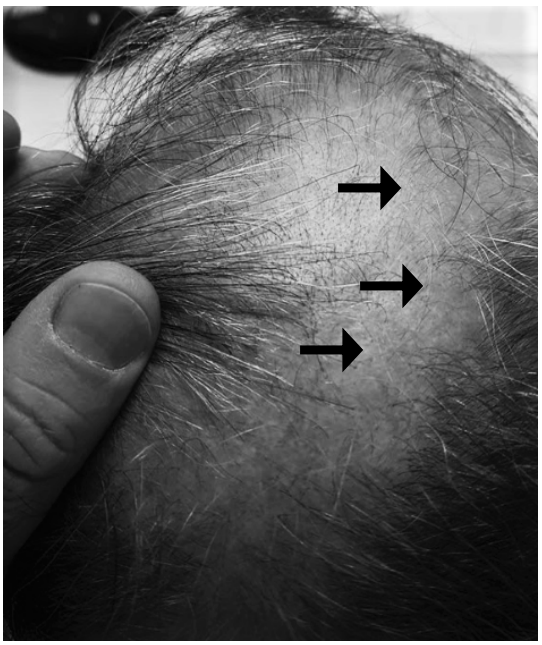

Figura 1: As setas indicam placas eritematosas, ovaladas, bem circunscritas e com aspecto infiltrado.

Devido à persistência das lesões, a hipótese clínica de linfoma foi levantada e uma biopsia incisional foi realizada. O resultado do anatomopatológico mostrou: "Derme com agregados linfoides formando nódulos, alguns com centros germinativos" (Figura 2).

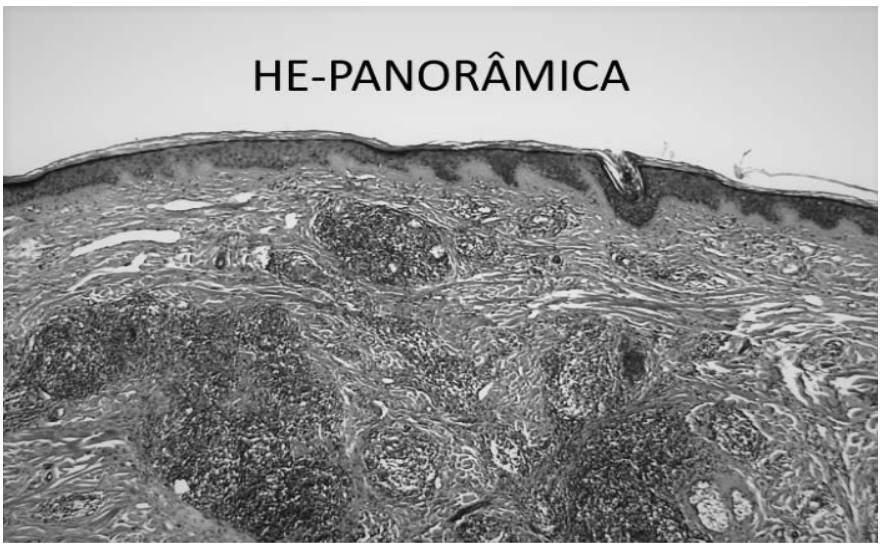

Figura 2: Agregados linfoides formando nódulos, alguns com centros germinativos.

Foi então recomendada a realização de um estudo adicional com imuno-histoquímica da amostra. Os antígenos pesquisados e seus respectivos resultados foram:

- BCL-2: negativo em centros germinativos. Positivo ao redor de folículos linfoides;
- CD3: revelando linfocitos T na periferia dos nódulos;
- CD20: positivo em nódulos linfoides;
- CD30: negativo;
- Ki67: positivo em centros germinativos.

O perfil imuno histoquímico favorece processo reacional linfoide ou pseudolinfoma.

Com o uso de propionato de halobetasol, o quadro teve melhora na sintomatologia inicialmente com posterior recidiva. Foi optado por infiltração com triancinolona 4mg/ml em sessões a cada 3 semanas. Mesmo com esse tratamento, a melhora clínica e sintomática foi parcial.

IV. Discussão

O pseudolinfoma cutâneo (PLC) é um termo utilizado para descrever um grupo heterogêneo de reações linfoproliferativas cutâneas benignas raras, constituídas por células B e T, que podem simular linfomas clínica ou histologicamente. Acomete preferencialmente jovens adultos (menores de 40 anos), caucasianos, com predileção por mulheres (3:1). Entretanto, casos envolvendo diferentes grupos etários foram relatados. [7,8,9]

Outra grande dificuldade é determinar o agente causal do pseudolinfoma, visto que o mesmo pode ser idiopático ou ter etiologia definida, sendo as mais frequentes as causas infecciosas (*Borrelia sp, Treponema pallidum,* Herpes Virus, HIV); drogas (antibióticos, anti-hipertensivos, antiarrítmicos, anticonvulsivantes, antipsicóticos, ansiolíticos, antidepressivos, imunossupressores e AINES) e outros (tatuagens, piercings, picada de artrópodes, vacinação, alérgenos).[1,5]

Para tornar o diagnóstico do pseudolinfoma possível é preciso basear-se na combinação de fatores clínicos, histopatológicos e imuno-histoquímicos, sendo imprescindível excluir lesões malignas, como linfomas cutâneos de células B e T, dentre outros diagnósticos diferenciais como sarcoidose, lúpus eritematoso, hiperplasia angiolinfóide ou mesmo rosácea granulomatosa. Além disso, uma anamnese e exame físico minuciosos associados a exames complementares, como sorologias, devem ser realizados na tentativa de elucidação do diagnostico etiológico.[8,10,9]

A apresentação histopatológica é sugerida de acordo com a predominância do padrão histológico (nodular, epidermotrópico, dérmico difuso, subcutâneo, intravascular); morfologia celular (anaplásico, centrocítico ou centroblástico); tamanho dos linfócitos; composição do infiltrado; e imunofenotipagem (células B e T; CD4; CD8; CD30; CD68), visto que pode haver mais de um tipo diferente presente em uma mesma amostra.[6,8]

Há diversas formas de classificá-lo de acordo com a literatura, seja pela causa, pelo tipo celular predominante (célula T, célula B ou misto), ou características clínicas. A principal classificação se baseia no tipo histológico: [6,10]

1. Pseudolinfoma Nodular: Pseudolinfoma, o tipo mais comum (clássico), se assemelhando com linfomas cutâneos, clinicamente ou histologicamente. Caracterizado por nódulos solitário ou múltiplos. Subdividido de acordo com a predominância linfocitica B,T ou mista.[6,10]
2. Pseudo–micose fungoide (pseudo-MF): se assemelha histologicamente à micose fungoide. Grupo com amplo espectro clínico.[6,10]
3. Outros pseudolinfomas: são apresentações diferente das demais, como o angioqueratoma papular solitário.[6,10]
4. Pseudolinfoma intravascular: acúmulo reativo de linfócitos atípicos em vasos linfáticos.[6,10]

O pseudolinfoma de células B, também chamado de linfocitoma cútis ou hiperplasia linfoide cutânea, é o protótipo do pseudolinfoma cutâneo nodular, com predominância histológica de células B, a variante mais comum dentre os pseudolinfomas. Ele representa uma resposta imune local exacerbada a diversos estímulos, principalmente picadas de artrópodes. Apesar dos pseudolinfomas cutâneos em geral serem mais comuns em mulheres, este subtipo se mostra mais prevalente em homens (3:1).[2,9]

Clinicamente, apresenta-se como um nódulo avermelhado solitário, placas ou pápulas múltiplas. Os locais de maior acometimento são rosto, pescoço, parte superior do tronco e membro superior. Lesões no lóbulo da orelha, mamilos e escroto são altamente relacionados ao linfocitoma cútis associado à bactéria *Borrelia burgdorferi.*[2]

São poucos os achados dermatoscopicos descritos na literatura. Estes relatam linhas reticulares brancas sob fundo rosado e alguns vasos lineares finos através dessas linhas. Essa combinação de características dermatoscópicas podem ser sugestivas para o diagnóstico do linfocitoma cútis.[2]

O linfocitomacutis é caracterizado por um denso infiltrado nodular na derme reticular, podendo se estender para as partes superficiais do subcutâneo. O infiltrado mostra pequenos linfócitos com núcleos densos de cromatina e centros germinativos reativos que contem macrófagos corporais tingíveis. Os linfócitos não apresentam atipia nuclear significativa e podem ser observados eosinófilos misturados e componente granulomatoso. Existe uma mistura

variável de células T, que correspondem a menos de 30% do infiltrado.[6,8]

A maior parte do infiltrado é composta pelas células B CD19, CD20, CD79a e PAX-5. As células nos folículos reativos expressam bcl-6 e são negativas para o bcl-2. As células B interfolliculares expressam bcl-2, mas são negativas para bcl-6. As redes de células dendríticas foliculares CD21 são regulares e bem demarcadas. A atividade proliferativa é maior e restrita principalmente nos centros germinativos, quando exposta a coloração Ki-67 ou MIB-1.[6,10]

O principal diagnostico diferencial a ser descartado , o linfoma de células B, geralmente mostra positividade para CD10, Bcl-6 (fora dos folículos), Bcl-2 (nos folículos) e uma restrição monoclonal à imunoglobulina kappa ou lambda da cadeia leve, enquanto os infiltrados benignos são geralmente CD10, Bcl-6, Bcl-2 negativo e exibem um padrão policlonal com expressão de cadeia leve.[10,11]

Pode-se entender melhor a correspondência dos marcadores e seus respectivos tipos celulares da figura 2 demonstrada no Quadro 1.

Finalmente, a imuno-histoquímica para células em proliferação (detectada pelo marcador MIB-1) é uma ajuda diagnóstica essencial, revelando na maioria dos casos uma porcentagem de proliferação normal a alta de células do centro germinativo a diminuição da proliferação observada no linfoma de células foliculares centrais.[8]

Pseudolinfoma Nodulares de Células T ou mistos compartilham os mesmos achados clínicos, histológicos e mesmo etiopatológicos,mas são na maioria das vezes idiopáticos e acomete ambos genêros e todas as idades.[12,13]

Existem diversas opções terapêuticas, como administração tópica ou intralesional de corticoides, excisão simples, criocirurgia, ablação por laser, terapia fotodinâmica ou radioterapia. Para quadros disseminados podem ser usados corticoides sistêmicos, interferon alfa ou hidroxicloroquina. A escolha da melhor forma de tratamento deve ser individual, a depender da necessidade e características dos pacientes. Por fim, é importante lembrar que o seguimento dos pacientes é crucial, uma vez que o quadro pode evoluir para linfoma cutâneo.[8,12,13]

V. Conclusão

O linfocitoma cútis é o subtipo mais comum do pseudolinfoma cutâneo de células B, acometendo principalmente homens. Existem diversos fatores predisponentes, variando desde medicamentos até condições infecciosas. Para a realização do diagnostico, é imprescindível a combinação de fatores clínicos, histopatológicos e imunohistoquímicos, sendo necessário excluir lesões malignas assim como outros diagnósticos diferenciais já relatados. Existem inúmeras possibilidades terapêuticas, devendo esta ser eleita de forma individualizada para cada paciente. Uma vez que o paciente do caso foi submetido ao tratamento com melhora parcial, o mesmo permanece em acompanhamento no serviço de dermatologia, pois em casos de persistência, novas análises histopatológicas e imuno-histoquímicas deverão ser realizadas pelo risco de evolução para malignidade.

Anexos

Quadro 1: Relação dos marcadores com os tipos celulares

TIPO DE CÉLULA	MARCADORES
Células T[1]	CD45+, CD3+
Células T citotóxicas[1]	CD45+; CD3+; CD8+
Linfócitos B[1]	CD45+; CD19+; CD20+; CD24+; CD38; CD22
Linfócitos T Helper[1]	CD45+, CD3+ CD4+
Linfócitos T reguladores[1]	CD4, CD25, FOXP3 – fator de transcrição
Marcador de proliferação celular – produzido durante a fase ativa da proliferação celular[2]	KI67
Gene anti-apoptótico – regulador da membrana externa da mitocôndria[3]	Bcl-2

Fonte: CHAN, J. K. C, 1988; LIN, Bingzhen, 2004; SCHOLZEN, Thomas 2000[14,15,16]

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Heart Disease Detection using Machine Learning

By Rashmi S K

Alvas Institute of Engineering and Technology

Abstract- Every person's health is impacted by a confirmation of circumstances, and certain diseases are fatal and have serious side effects. One such serious condition that affects people of all ages is heart disease. this paper suggests a preprocessing strategy to improve the categorization precision of ECG data We are suggesting an ECG sensor-based healthcare monitoring system. Since the values are so crucial, ECG sensors are necessary for patient remote monitoring. Elements from the ECG wave are extracted using a verification of extraction techniques to be able to accurately predict cardiac disease The patient's ECG is continuously monitored using a mobile app. The different algorithms used in data mining eliminate the extra time and work required to perform multiple tests to identify diseases. Data collection employs ECG sensors. The acquired data is stored on a storage device before data Mining techniques are used to it. These equations indicate the patient's potential for cardiac disease. Doctors may utilise the outcomes for diagnostic purposes. The technology will predict cardiac illness by utilizing machine learning methods.

Keywords: heart disease prediction, UCI dataset, machine learning.

GJMR-F Classification: LCC Code: RC685-688

Strictly as per the compliance and regulations of:

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Abstract- Every person's health is impacted by a confirmation of circumstances, and certain diseases are fatal and have serious side effects. One such serious condition that affects people of all ages is heart disease. this paper suggests a preprocessing strategy to improve the categorization precision of ECG data We are suggesting an ECG sensor-based healthcare monitoring system. Since the values are so crucial, ECG sensors are necessary for patient remote monitoring. Elements from the ECG wave are extracted using a verification of extraction techniques to be able to accurately predict cardiac disease The patient's ECG is continuously monitored using a mobile app. The different algorithms used in data mining eliminate the extra time and work required to perform multiple tests to identify diseases. Data collection employs ECG sensors. The acquired data is stored on a storage device before data Mining techniques are used to it. These equations indicate the patient's potential for cardiac disease. Doctors may utilise the outcomes for diagnostic purposes. The technology will predict cardiac illness by utilizing machine learning methods.

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I. Introduction

The healthcare sector has been utilizing new technologies to deliver better and more sophisticated healthcare facilities. including commerce, healthcare, social networking, and education. To do so, provide better and more advanced healthcare facilities, the healthcare The sector has been embracing new technology. Remote and real-time patient monitoring is now possible Thanks to the IoT (Internet of Things), continuous health is now a possibility. permits clinicians to provide immediate advise or therapy through monitoring. Early identification of Heart disease is critical to saving lives and maintaining a healthy lifestyle among people. early detection of heart disease is crucial because it affects a bigger population than previously thought. The development of various IoT capabilities and tools to follow patients' health problems on a regular basis has greatly improved healthcare monitoring. Additionally, Patients and clinicians can communicate more readily, which enhances the quality of care and reduces hospital stays and medical expenses. Setting The main objective of utilising IoT in healthcare systems is to provide a fully automated environment for patient monitoring and real-time help and treatment. It is increasingly vital to have portable technology that patients may use at home to measure their ECG patterns and quickly identify their ailment. Therefore, a thorough assessment of the accessible technologies for tracking heart-related disorders is done in this work. The research shows that the raw data was gathered using noise and useless information. These are inaccurate and unrelated information that is useless for formulating a diagnosis. since the noise and extreme data volatility Reduced categorization sensitivity, accuracy, and precision. Therefore, in this study, a unique pre-processing technique is used to get rid of noise and unimportant data from ECG signals. Relevant features are discovered using the correlation technique to increase data efficiency. ECG signals are categorised according to waveforms using classifier method for machine learning algorithms like KNN, naive Bayes, and Decision trees. The ECG waveform variation can be diagnosed and the kind of abnormality and disorder can be determined using the classifier with the best metrics. Around the world, machine learning is applied in many different fields. The healthcare industry is not an exception. Machine learning can be very helpful in identifying whether disorders like heart problems, mobility issues, and other challenges if it will even exist. Such information, if anticipated long in ahead, can clinicians with benificial insights, allowing them to then tailor their diagnosis and course of treatment for each patient.

Problem Statement: One of the most exciting and difficult topics is using machine learning to forecast heart illness. A quick and effective detection system must be created owing to the lack of professionals and the high rate of cases that are incorrectly diagnosed. This work's primary aims to employ a classifier model to extract the important patterns or characteristics from the medical data. You can see the quality that are more significant for diagnosing heart disease. This will make it easier for medical professionals to fully comprehend the underlying causes of disease.

II. Objectives

- The goal of our research is to identify the heart disease dignosis more precisely using fewer variables

Author: Alvas Institute of Engineering and Technology.
e-mail: skrashmikanth@gmail.com

- The stages of the disease are determined using fourteen heart
- Disease prediction criteria
- We are sending the doctor's report via Telegram Web.

III. Literature Survey

A method that predominantly prioritized algorithm accuracy was put out by Archana Singh and Rakesh Kumar et al. [1]. It was one of the parameters taken into consideration by the authors when analyzing the algorithmic performance. The dataset utilized for testing and training purposes determines how accurate machine learning algorithms will be. KNN was exhibited as the best algorithm when they compared the algorithms using a dataset with parameters like age, type of chest discomfort, cholesterol, and resting time. They employ the following methodologies: K-nearest Neighbour, support vector machine and leniar regression and Decision Tree One drawback is that it requires numerous data sets because it uses so many attributes.

A method with a strong emphasis on feature selection and the prediction was put out by Rahul Kataria and P. Srinivas et al. [2]. For every automated system, these two are necessary. We can forecast heart disease more accurately by making wise feature choices. A few techniques, such as the random search algorithm and the hybrid grid search algorithm, were summarised by the authors as being helpful for choosing the features. They chose some key traits that are commonly utilized to predict cardiac disease, such as gender, age, resting blood pressure, ECG readings, heart rate, etc. They employ the following methodologies: Support vector machines (SVM), Decision trees (DT), Artificial neural networks (ANN), and Random forests (RF).

An effective machine learning-based diagnosis method for the diagnosis a diagnosis of heart disease has been made according to Jian Ping Li et al. [3]. Creating a system for heart disease diagnosis identification is the studys originality. A small improvement in prediction accuracy made by Jian Ping Li et al. has a significant impact on the identification of serious diseases. Four well-known feature selection technique are used in this case, and one additional feature selection approach is provided. Both the LOSO CV technique and performance evaluation measures are employed. The information for Cleveland heart disease is utilized for testing. The dataset has been pre-processed using methods including Standard Scalar (SS), Min-Max Scalar, and deleting attribute missing values. For preparation and testing.

B. Keerthi Samhitha, et al. [4] contributed to the UCI machine learning archive's Cleveland heart dataset. Additionally, they put forth a cutting-edge strategy that increases the reliability of cardiovascular disease prognosis and emphasises literature survey using machine learning approaches, Rahul Kataria and P. Srinivas identified the major highlights in their publication of machine learning techniques. Different combinations of highlights and a few well known grouping strategies accustomed to display the forecast model. They were able to produce an improved display level with a precision level of 88:7% using the halfbreed irregular woods and a straight model.

Machine learning's "Application for the Diagnosis of Coronary Heart Disease" [5] was put up by Sameer S. Yadav et al. after extensive research and analysis of An technique with greater precision was developed as a result of numerous machine learning algorithms. The problem is determining which research will help with cardiovascular identification and which will be insufficient. The Cleveland dataset, which has high statistical precision, is utilised for local development programmes.

They have combined cross-validation and the test train division approach to ascertain the ideal set of the parameters for analysis. For example, Naive Bayes, K-Nearest Neighbors, Logistic Regression, and Neural Network algorithms are employed.

B. Keerthi Samhitha, et al. [6] proposed a novel approach that targets finding critical highlights by applying machine learning procedures, improving the precision in the forecast of cardiovascular illness. They used the Cleveland Heart dataset based on the data from the UCI machine learning archive for preparation and testing purposes. The forecast model is displayed with different highlights mixtures and a few well-known grouping techniques. Utilizing expectation model for heart illness with the half-breed irregular woods and a straight model, they were ability to accomplish an improved exhibition level with a precision level of 88:7%.

Geetha S, Santhana Krishnan J[7]. The author attempted to concentrate on male patients in this paper and took into account a amount of variables that may contribute to heart disease, such as risk factors and risk categories. One of the most often used data mining technique was used by the author, WEKA, and KNN algorithm was employed for the prediction portion. While the author utilised two algorithms in order to get analysis, other algorithms and prediction approaches can be employed, and while the elements examined during the prediction are rather few, we can uncover other aspects that are affecting cardiac condition and work on those.

Mohan et al. [8]. The accuracy of cardiovascular disease prediction can be enhanced by utilising hybrid machine learning approaches, with the objective of identifying crucial by utilising machine learning. The expectation model is created using a few well-known arranging procedures. which is composed of different highlighted mixtures. Several data mining techniques and methods, including KNearest Neighbours, LR, SVM,

neural networks, and vote, have been successfully utilized to forecast heart disease.

Chandra P, Shekar K, et al. [9], to lower the risk of heart disease, which is a major health concern for millions of people worldwide. This study tried to examine a dataset on heart illness using several sorts of data mining methodologies in order to produce a 100% right model based on data mining algorithms. The findings might be critical for gaining insights from the data, forecasting the prognosis of new patients with heart disease, and establishing effective techniques for improving the accuracy, efficacy, and calibre of heart disease treatment processes. This research developed a basic SVM model for predicting heart disease. The appropriate healthcare data is created through the usage of the methodical framework provided in this study for cardiac disorders.

Monther Tarawneh, Osama Embarak [10], The Nave Bayes method is used in this paper's DSS (Decision Support System). In the proposed system, users' information on their sex, smoking habits, blood sugar, type of chest discomfort, etc. are first collected. For supervised learning, they next utilised a Nave Bayes classifier. As input, it receives an independent variable. The Advanced Encryption Standard algorithm is utilised to encrypt the patient's data because it is less time-consuming and

When compared to other methods, it provides superior accuracy. Despite reducing the characteristics, the dominant technique exceeds the Naive Bayes in terms of accuracy, yielding an accuracy of 89.77%.High accuracy is attained here by using only a few criteria for prediction.

Ravinder Kumar and Kanika Pahwa [11], Divide the process into three steps for this article. Raw data is subjected to preprocessing in the first stage. Age, sex, Cp (associated to chest discomfort), cholesterol, etc. are examples of raw data. In this stage, data transformation is completed. This problem is transformed into a binary class problem using data transformation. The output of this second stage, which applies feature selection to the pre-processed data as input, is a relevant feature. Unimportant data are eliminated during feature selection. The Gain Ratio is used to compute the score of an attribute. At the very end, the classification algorithm is used. They employed the Naive Bayes approach and the Random Forest algorithm to anticipate cardiac attacks. They made advantage of a database that is open to the public. The ROC curve and area under the curve for the confusion matrix are assessed. Two algorithms' accuracy is compared.

Shubhankar Mayank, Ritika Chadha, and others [28], KNN, SVM, and ANN are utilised in this article to predict cardiac disorders. Compare the outcomes of these three algorithms and the ensemble classifier as well. They classified using binary and multiclass systems. Cross-validation and percentage split are the two methods of evolution employed. Multiclass classification is inferior to binary classification. The percentage split result is superior to cross-validation. Data are first collected in this method. from a dataset and then, using feature selection, data are chosen and used as model input.

IV. Proposed Work

A system architecture is a conceptual framework for organizing a system. the model outlines the structure, behavior, and other features of a system. An architecture description is a formal description and representation of a system that is designed to make it easier to analyze its structures and behaviors. System architecture may be made up of system elements and developed subsystems that work together to complete the entire system. The architecture description languages (ADLs) collectively refer to efforts to formalize languages that describe system architecture. Various organizations define systems architecture in a variety of ways, including the fundamental organization of a system as seen in its parts, how they interact with one another and the environment, and the ideas that have guided its development. A system graphic that shows how users interact with various components, how functionality is assigned to hardware and software components, and how software architecture is mapped onto hardware architecture. An allocation of physical elements that provides a design solution for a consumer product or life cycle process that tries to meet the objectives of functional architectures and the requirements baseline. The most important, ubiquitous top-level strategic innovations, choices, and related arguments about the overall structure (i.e., the core elements and their relationship), along with related traits and behavior, make up an architecture. A description of the design and elements of a computer system. If it is documented, it might include information like a comprehensive summary of the current networking, software, and hardware capabilities. a comprehensive component-level design of the system to guide development or a formal description of the system.

The combination of a product's life cycle processes and design architectures. The organization of components, how they relate to one another, and the rules and ideas that have guided their development over time. A system architecture can be viewed as a collection of representations of a current (or upcoming) system. These representations start off by describing a broad, high-level functional organization and then gradually get more specific and concrete.

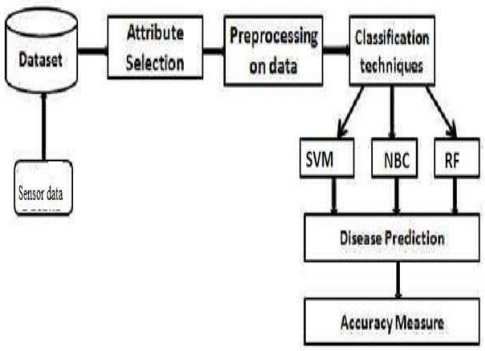


Fig. 1: Proposed system architecture

Algorithms Used

KNN: A well-known machine learning approach. K-Nearest Neighbours (KNN) is a classification and regression algorithm.

When it comes to predicting heart disease, KNN may be used to separate people into two groups based on whether they have heart disease or not. The approach works by determining the K data points in the training set that are closest to a new data point—a patient—and categorizing the patient based on the class with the most members among the K closest neighbors.

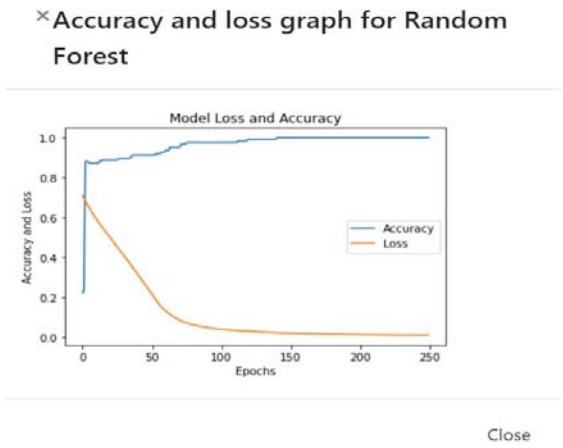
Support Vector Machine: To handle classification and regression problems, powerful machine learning techniques called Support Vector Machines (SVM) are used. In the context of heart disease prediction, SVM may be used to categorise individuals into two groups based on whether they have or do not have heart disease. The method searches for the best hyperplane to partition the two classes in a high-dimensional space.

Naïve Bayes: A well-known machine learning algorithm for classification problems, Naive Bayes is utilised. It is based on the Bayes theorem, which states that when a hypothesis (such as a patient having heart disease) is known to exist, the likelihood of the evidence (such as the patient's symptoms) is inversely associated. When it comes to predicting heart disease, Naive Bayes may be used to classify people into two groups according on whether they have heart disease or not.

Logistic Regression: Is a popular machine learning strategy for dealing with binary classification problems. It is used to evaluate the chance of an event occurring based on specified independent criteria. In the context of heart disease prediction, logistic regression may be used to classify patients as having or not having heart disease.

Random Forest: For classification and regression problems, a powerful machine learning approach is used. It employs an ensemble learning approach that blends various decision trees to provide more exact predictions. When it comes to predicting heart disease, Random Forest may be used to separate people into two groups based on whether they have heart disease or not. For classification and regression problems, a powerful machine learning approach is used. It employs an ensemble learning approach that blends various decision trees to provide more exact predictions. When it comes to predicting heart disease, Random Forest may be used to separate people into two groups based on whether they have heart disease or not.

Accuracy Results



Accuracy Graph

The accuracy and loss graphs for Random Forest models might not look like the typical graphs for nural networks. Instead, they might show a plot of the metric used to evaluate the models performance over time, such as the MSE or R-squared value.

V. Conclusion

Heart attacks are a major public health issue in modern culture. Initially, we attempted to incorporate several techniques in this project using machine learning algorithms and the Internet of Things. Finding the missed predictions in the confused matrix provides us with the error rate, which we can then remove to determine the classifier's accuracy. We built a dataset from the patient's family history and compared it to the patient's record to see if there was a chance they may have a heart attack. We tried to apply it by using the machine learning algorithm.

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18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

The Administration Rules

Administration Rules to Be Strictly Followed before Submitting Your Research Paper to Global Journals Inc.

Please read the following rules and regulations carefully before submitting your research paper to Global Journals Inc. to avoid rejection.

Segment draft and final research paper: You have to strictly follow the template of a research paper, failing which your paper may get rejected. You are expected to write each part of the paper wholly on your own. The peer reviewers need to identify your own perspective of the concepts in your own terms. Please do not extract straight from any other source, and do not rephrase someone else's analysis. Do not allow anyone else to proofread your manuscript.

Written material: You may discuss this with your guides and key sources. Do not copy anyone else's paper, even if this is only imitation, otherwise it will be rejected on the grounds of plagiarism, which is illegal. Various methods to avoid plagiarism are strictly applied by us to every paper, and, if found guilty, you may be blacklisted, which could affect your career adversely. To guard yourself and others from possible illegal use, please do not permit anyone to use or even read your paper and file.

Criterion for Grading a Research Paper (Compilation) by Global Journals

Please note that following table is only a Grading of "Paper Compilation" and not on "Performed/Stated Research" whose grading solely depends on Individual Assigned Peer Reviewer and Editorial Board Member. These can be available only on request and after decision of Paper. This report will be the property of Global Journals.

Topics	Grades		
	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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