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தமிழ்க் கிறித்தவ நாடகங்களில் விழிப்புணர்வு சிந்தனைகள்
SOCIAL AWARENESS THOUGHTS IN TAMIL DRAMAS

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ஆய்வுச் சுருக்கம்

இயேசுபிரான் தம் சீடர்களை நோக்கி உலகெங்கும் சென்று படைப்பிற்கெல்லாம் நற்செய்தியைக் கூறுங்கள் என்று கட்டளையிட்டார். சீடர்கள் கட்டளைகளை ஏற்று மறைபரப்பும் பணிக்காகத் தமிழகத்திற்கு வருகை தந்தனர். இந்நிலையில், மறைபரப்பும் பணியாளர்களுக்கும் மக்களுக்குமிடையே பல்வேறு தடைகள் இருந்தன. அவற்றுள் ஒன்று மொழித் தடையாகும். இதனால் நற்செய்தி அறிவிப்பது பெரும் தயையாக இருந்தது. அத்தகைய சூழலில் திருத்தொண்டர்கள் தமிழ் மக்களின் விருப்பக் கலையான நாடகக் கலையைத் தம் சமயத்தைப் பரப்புவதற்கான கருவியாகக் கொண்டனர்.

அவர்கள் கிறித்தவ சமயக் கருத்துகளை நாடகங்களாக்கி மக்களைக் காணச் செய்தனர். இவ்வாறு தமிழ்க் கிறித்தவ நாடக இலக்கியக் கலை புத்தெழுச்சி பெற்றது. தொடக்க காலத்தில் தோன்றிய விவிலிய நாடகங்கள் இயேசுவே இறைமகன் என்பதை மக்கள் ஏற்றுக் கொள்ளும் நோக்கோடு படைக்கப்பட்டன. பின் கிறித்தவ நம்பிக்கையில் உறுதிப்பாடடையும் நோக்கில் நாடகங்கள் உருவாக்கப்பட்டன. கால மாற்றத்தால் சமுதாயத்தைப் பற்றிய மகத்தான உண்மைகளை உணர்த்த வேண்டிய சூழலில் தமிழ்க் கிறித்தவ நாடகங்கள் விழிப்புணர்வு சிந்தனைகளுடன் வெளிவரலாயின என்பதைச் சமுதாயத்திற்கு உணர்த்துவதே இவ்வாய்வுக் கட்டுரையின் நோக்கமாகும்.

கருச்சொற்கள் : மொழித்தடை, திருத்தொண்டர்கள், புத்தெழுச்சி, விழிப்புணர்வு

ABSTRACT

Jesus commanded his disciples to go into all the world and preach the good news to all creation. When the disciples accepted orders and came to Tamil Nadu for preaching. There were many barriers between them and the people, one of them being the language barrier. Therefore it was a great mercy to announce the gospel. In such an environment, the monks took the tamil people's favourite art of drama as a tool to spread their religion. Biblical dramas that appeared in the early period were created with the aim of making people accept that jesus is the son of god, then dramas were created with the aim of confirming the Cristian faith. Due to the change of times the environmental tamil Christian dramas which had to convey the great truths about the society came out with vigilance thoughts.

Key words : Language barrier, Devotees of God, Revival , Awareness

ஆய்வுமுன்னுரை

இயற்கையுடன் பின்னிப்பிணைந்து வாழ்ந்த பண்டைய தமிழரின் கலை உணர்வும் இலக்கியப் புலமையும் அளவிட்டுக் காண்பதற்கு அரிய ஆற்றலோடு அமைந்துள்ளன. இயற்கையிடமிருந்து கற்றவற்றைக் கலையாகவும் இலக்கியமாகவும் உலகிற்கு வழங்கிய பெருமை தமிழருக்குரியதாகும். இதற்குச் சங்க இலக்கியங்கள் சிறந்த சான்றுகளாக அமைந்துள்ளன. இத்தகைய சிறப்பு வாய்ந்த தமிழர் நற்றிழை,

இயற்றமிழ் இசைத்தமிழ் நாடகத் தமிழென

வகைப்படச் சாற்றினார் மதியுணர்ந்தோரே (பிங்கலநிகண்டு, நூற்பா 231, 6:8)

என்பதிலிருந்து இயல், இசை, நாடகம் என முத்தமிழாக வகைப்படுத்தினர். தூய மனத்தின் வெளிப்பாடு இயலாகவும், தூய நாவின் புலப்பாடு இசையாகவும், தூய உடலின் இயக்கம் நாடகமாகவும் கொள்ளப்படுகின்றன. வாழ்க்கையில் மனிதர்கள், கண்டுசுவைக்கவும், கேட்டுமகிழவும், உணர்ந்து உற்சாகம் பெறவும், சிந்தித்துச் சீர்தூக்கிப் பார்க்கவும், எழுச்சியூட்டும் இலக்கியமாக இருப்பது நாடக இலக்கியம் ஆகும். அவற்றுள் சமுதாயத்தின் மீது கொண்ட அக்கறையால், சமுதாய நலனுக்காகப் படைக்கப்பட்ட நாடகங்கள் விழிப்புணர்வு சிந்தனைகளையுடைய நாடகங்கள் ஆகும். இந்நாடகங்கள் மனிதனின் வாழ்க்கையைச் சீராக நடத்திச் செல்லும் வழிமுறைகளைக் கற்றுக் கொடுப்பதாக எவ்வளவுகின்றன. இந்நாடக இலக்கியங்கள், சமுதாயத்தில் காணப்படும் சிக்கல்களை எடுத்துக் கூறுவதோடு, மக்கள் அவற்றைக் களைந்து இன்புற்று வாழ வழி கூறுவதையும் நோக்கமாகக் கொண்டுள்ளன. சமுதாயச் சூழலை நோக்கவும் அவை தொடர்பாக ஆழ்ந்து சிந்திக்கவும், துணிந்து விமர்சிக்கவும் தொலைநோக்குச் சிந்தனைகளையும் வழங்குகிறது. இவை சமுதாயமாற்றத்திற்கு வழிவகுக்கின்றன. அவ்வகையில் கிறித்தவ சமயத்தில் காணப்படும் சிக்கல்கள், சறுக்கல்கள், வேறுபாடுகள் இவற்றைக் களைந்து கிறித்தவ மக்களை இயேசுவின் பார்வை கொண்டு சமுதாயத்தை அணுகவும் இயேசுவின் கொள்கை மதிப்பீடுகளை வாழ்வாக்கவும் அழைப்பு விடுக்கும் நாடகங்களாக தமிழ்க் கிறித்தவ விழிப்புணர்வு சிந்தனைகளைக் கொண்ட நாடகங்களாக அமைகின்றன.

இறையாட்சியும் இவ்வுலக ஆட்சியும்

அரசியல் என்னும் சொல்லுக்குப் பரந்த பார்வை மற்றும் குறுகிய பார்வை எனும் இருவகைகளில் பொருள் கொள்ளலாம். பரந்த பொருளில் அரசியல் என்னும் சொல் ஓர் ஊர் அல்லது ஒரு நகரம் அல்லது ஒரு நாடு இவற்றில் ஏதாவது ஒன்றில் வாழும் மக்களின் வாழ்க்கையையும் அவர்களுக்குரிய பொறுப்பு மற்றும் கடமைகளையும் சுட்டிக் காட்டுகின்றது. இவ்வாறு ஒரு சமூகத்தில் வாழும் மனித வாழ்க்கை முழுவதையும் அரசியல் என்னும் சொல் தன்னில் உள்ளடக்கி நிற்கின்றது எனலாம். தமிழ்க் கிறித்தவ நாடகங்களில் அரசியல் சார்ந்த சிந்தனைகள் காணப்படுகின்றன.

இயேசு நல்லதொரு அரசியல் குடிமகன். தமது சமய மரபுக்கே சவால் விடுத்த புரட்சியாளர். ஏழைப் பங்காளர், மனித உரிமைக் காப்பாளர் இறையரசுக்கு வெற்றிவிழா எடுத்தவர், ஓர் அரசியல் குற்றவாளியாகக் கொல்லப்பட்டவர்

(முனைவர் ஆ. ஜோசப், தொ.ஆ., பாதைகள் பயணங்கள்.., ப.19.)

இயேசு எந்த அரசியல் கட்சியையும் நடத்தவில்லை என்பது உண்மை. அவர் பிறந்து வளர்ந்த யூதக் குழுக்களுக்கும், யூதக்கட்சிகளுக்கும் தன் ஒத்துழைப்பைத் தெரிவிக்கவில்லை. ஆனால் எல்லா யூதக் குழுக்களிலிருந்தும் இயேசுவுக்கு நண்பர்கள் இருந்தனர். இயேசு எளிய மக்களின் தேவைகள், அவர்களது வாழ்க்கைப் போராட்டங்கள், அவர்தம் வாழ்வில் சந்தித்த சவால்கள் இவற்றையெல்லாம் நன்கு அறிந்திருந்தார். எனவே, எளிய கிராமப்புற மக்களுடன் தன்னை அடையாளப்படுத்திக் கொண்டார். அம்மக்களின் துன்பங்கள், வேதனைகள், நோய்கள், கவலைகளுடன் தன்னை ஐக்கியமாக்கிக் கொண்டார். எனவேதான், மானிடமகன் தொண்டு ஏற்பதற்கு அல்ல, மாறாகத் தொண்டு ஆற்றுவதற்கும் பலருடைய மீட்புக்கு ஈடாகத் தம் உயிரைக் கொடுப்பதற்கும் வந்தார் (மாற்கு 10:45) என்று விவிலியத்தில் விளக்கப்பட்டுள்ளது. பணிவிடை புரியத் தயாராக இருப்பதே தனது அரசியல், சமூகவாழ்வுப் பணிக்கான இலக்கு என்று தெளிவுபடுத்தியுள்ளார் இயேசு. இதனைத் தமிழ்க் கிறித்தவ நாடகப் படைப்பாளர்கள் நன்கு உணர்ந்துள்ளனர். தங்கள் நாடகங்களில் இன்றைய அரசியல் சூழல்களைச் சுட்டிக்காட்டி, மாற்றம் பெற வேண்டும் என்ற எதிர்நோக்கைத் தங்கள் படைப்புகளில் வெளிப்படுத்தியுள்ளனர்.

இன்றைய தேர்தல் முறை

இந்தியா ஒரு சனநாயகநாடு. இந்திய குடிமக்களாகிய நாம் அனைவரும் உரிமையும் கடமையும் உடையவர்கள். நமது முதல் உரிமை வாக்களித்தல். வாக்களிக்கும் மக்களை அரசர்களாக மதிப்பதற்குப் பதில் பிச்சைக்காரர்களாக்கி ஓட்டுக்கு ரூபாய் ஐநூறு, ஆயிரம் என்று தூக்கி எறிந்து வெற்றி பெற்றுவிடலாம் என்ற ஆணவப்போக்கு வந்துவிட்டது என்பதை ஆசிரியர் வி. லீமாரோஸ்,

இந்தத் தேர்தல் எல்லாம் வெறும் பித்தலாட்டம். ஆயிரக் கணக்கான மக்களை ஓட்டுப் போடவிடாமல் கள்ள நோட்டுகளால் பெட்டியை நிறைக்கிறார்கள்
(குருதியில் பூத்தமலர், ப.61)

என்ற வரிகளில் தேர்தல் பற்றிய ஆற்றாமையை வெளிப்படுத்தியுள்ளார். தேர்தல் காலங்களில் தொண்டர்களுடன் வீடுவீடாகச் சென்று வானவில்லை வளைத்துத் தருவேன் என்றெல்லாம் ஆசை வார்த்தைகளை அள்ளிவிடுவது இன்று இயல்பாகி விட்டது. இன்றைய அரசியல்வாதிகளின் தந்திரமொழியைத் இந்நாடகத்தில்,

அரசியலே வாக்குறுதிகளை வழங்குவதில் தானிருக்கிறது. வாக்குறுதிகளை நாம் கொடுத்துக் கொண்டேயிருந்தால் அவர்கள் பாட்டுக்குப் போய்க் கொண்டே இருப்பார்கள்
(குருதியில் பூத்தமலர் ப.18)

என்று பதிவு செய்யப்பட்டுள்ளது. ஏழ்மையுடைய பேதை மக்களிடம் பொய் வார்த்தைகளைக் கூறிவிட்டு, ஆட்சிக்கு வந்தவுடன் வாக்காளர்களையும், கூறிய வாக்குறுதிகளையும் மறந்துவிட்டு தங்களின் பைகளை நிரப்புவதில் முழுக்கவனத்தையும் செலுத்துகின்ற இன்றைய அரசியல்வாதிகளின் போக்கினை இந்நாடகம் சிறப்பாக எடுத்துரைக்கிறது.

இவ்வாறு தமிழ்க் கிறித்தவ விழிப்புணர்வு சிந்தனையுடைய நாடகங்களில் ஆன்மீகத்தோடு இன்றைய அரசியலும் மக்களின் கவனத்திற்குக் கொண்டு வரப்பட்டுள்ளது. இதுவும் இன்றைய தேவையாகிவிட்டது. கிறித்தவ மதம் மக்களை நல்வழிப்படுத்துவதையே நோக்கமாகக் கொண்டது. ஆனால் இன்று நம்மைச் சுற்றியுள்ள நிகழ்வுகளையும் தெரிந்து கொள்ள வேண்டியுள்ளது. கிறித்தவ நாடகங்களில் அரசியலைப் பற்றிப் பேசுவது பாவம் அன்று. ஏனெனில் நாம் வாழும் சமுதாயத்தில் ஏதோ ஒருவகையில் நாமும் ஓர் அரசியல் கட்சியைச் சார்ந்திருக்க வேண்டியுள்ளது. அக்கட்சி நன்மைபயக்குமா? என்ற விழிப்புணர்வை மக்களுக்குத் தெரிவிப்பது கடமையாக மாறியுள்ளது. இவ்வாறு கிறித்தவ நாடகங்களில் அரசியல் பற்றிய செய்திகள் கூறப்பட்டுள்ளன.

சமுதாய அக்கறை கொண்ட புதியதலைமுறை

இளைஞர்களின் ஆற்றல் மாபெரும் ஆற்றல். அதை எதிர்த்து நிற்க எந்த ஆற்றலாலும் முடியாது. சமுதாயத்தில் புரையோடிப் போயிருக்கும் அவலங்களைத் தூக்கி எறிய இளைஞர்களால் தான் முடியும். வேறுபாடுகளைக் கடந்து சகோதரத்துவமே இன்றைய உடனடித் தேவை. ஒன்றே குலம் ஒருவனே தேவன், அன்பே சிவம் என்ற உயரிய சிந்தனை மக்களிடம் வளர வேண்டும். இதனைச் செயல்படுத்தும் மாபெரும் ஆற்றல்களாக இருப்பவர்கள் இளைஞர்கள். இவர்களைச் சமுதாயச் சீர்கேட்டுப் புயல்களால் அலைக் கழிக்க முடியாது. காட்டாறுகளால் கலைத்துச் செல்ல முடியாது. இவர்களால் தான் பாறையாக நின்று சமுதாய மாற்றத்தை ஏற்படுத்த முடியும் என்ற ஆழமான நம்பிக்கையைத் தமிழ்க் கிறித்தவ விழிப்புணர்வு சிந்தனைகளையுடைய நாடகங்கள் இளைஞர்களுக்கு எடுத்துரைக்கின்றன.

இக்கால இளைஞர்கள் ஏதோ பிறந்தோம், எப்படியோ வளர்ந்தோம், எதையோ தேடிப் பயணிக்கிறோம் என்று குப்பைக் கோழிகளைப் போல் இருக்கக் கூடாது. பிறந்ததன் பொருளை, வரலாற்றுச் சுவடுகளாக்கிச் செல்ல வேண்டும் என்ற கொள்கை உடையவர்களாகத் திகழ வேண்டும். இதனை மெழுகுவத்திகள் நாடகத்தில் புற்றுநோய்க்கு மருந்துகண்டுபிடிக்கும் மருத்துவ ஆய்வு மாணவர் ஜான்சன் செயல் வழியாக எடுத்துரைக்கப்படுகிறது.

சாவதற்குள் மனிதகுல மேம்பாட்டுக்காக ஏதாவது ஒரு நன்மையைச் செய்து விட வேண்டும். அதைச் செய்துவிட்டுத்தான் சாக வேண்டும் (மெழுகுவத்திகள், ப.42)

என்று ஜான்சன் கூறுவதிலிருந்து இளைஞர்கள், சமுதாயம் பயனடைய வேண்டும் என்ற உயர்ந்த எண்ணம் கொண்ட கொள்கைப் பாதையில் பயணிக்க வேண்டும் என்று அழைப்பு விடுத்துள்ளதை அறிய முடிகிறது.

சமுதாயமாற்றத்தை உருவாக்கும் வலுவான ஆற்றல் கல்வி

மேனாட்டுக் கிறித்தவர் வரவால் விளைந்த வளர்ச்சி மாற்றத்தால் தமிழக மக்கள் தம் அன்றாட வாழ்வில் மேம்பாடு ஏற்பட்டது.

மனித மேம்பாட்டிற்கு அடிப்படையான கல்வியைப் பெற்றோர் 18-ஆம் நூற்றாண்டில் இந்திய நாட்டில் 2 விழுக்காட்டிற்கும் குறைவாகவே இருந்தனர். பத்தொன்பதாம் நூற்றாண்டில் கிறித்தவக் கல்வி நிறுவனங்களின் உருவாக்கத்தால் கற்றோர் தொகை மிகுதியானது.

1931-ஆம் ஆண்டு 6.9 விழுக்காடும், 1941-இல் 12.2 விழுக்காடும் 1951-ஆம் ஆண்டு 20 விழுக்காடுமாக அத்தொகை பெருகியதற்குக் கிறித்தவரும் பெருங்காரணமாவார்.

(சூ. இன்னாசி, கிறித்தவமும் தமிழும், ப.112)

என்பதன் வழி கல்வி ஒரு பொருண்மைதரும் அமைப்பு, பண்பாட்டுப் பகுதியின் ஒருமுக்கிய உறுப்பு, மாற்றத்தை உருவாக்கும் ஆற்றலை உள்ளடக்கிய வலுவான கருவி விடுதலைக்கு வித்திடும் ஓர் ஆயுதம். இக்கல்வியிலிருந்து உருவாகும் அறிவும் அதிகாரமும் பேராற்றல் கொண்டது. ஏனெனில் அறிவைக் கொண்டவர் அதிகாரத்தைக் கையில் கொண்டவராகிறார் என்பது வரலாறு நமக்குக் காட்டும் பாடமாக அமைகிறது. சமூகத்தில் காணும் சவால்களையும் சிக்கல்களையும் தனித்தனியாகவும் குழுவாகவும் எதிர்கொள்ளத் தேவையான வலுவை மாணவர்களுக்குக் கொடுக்க வேண்டும். இத்தகைய கல்விமுறை குறித்து விழிப்பின் வழி நாடகத்தில்,

ஆசிரியர் கேட்கின்ற கேள்விகளுக்கு மாணவர்களும், மாணவர்கள் கேட்கிற கேள்விகளுக்கு ஆசிரியரும் பதில் சொல்லணும், அதற்குப் பெயர்தான் படிப்பு. இந்தப் படிப்பு அறிவைவளர்க்கும் ஆளுமையை உருவாக்கும்

(விழிப்பின் வழி, ப.19)

என்று கூறுவதன் வழி, கல்வி என்பது ஆசிரியர் கூறுவதை மாணவர்கள் கேட்க வேண்டும் என்பதல்ல. மாறாக ஆசிரியர்கள் மாணவர்களைக் கேள்வி எழுப்பத் தூண்ட வேண்டும். மாணவர்கள் சிந்திக்கும் போதுதான் கேள்விகள் பிறக்கின்றன. கேள்விகளுக்கு விடையை அவர்களாகவே முயன்று அறிந்து கொள்ள வாய்ப்பளிக்க வேண்டும்.

முடிவுரை

நாடங்கள் என்பதுவெறும் பொழுதுபோக்கு கலை அன்று, மாறாக சமுதாய மாற்றத்திற்கான கருவியாகும். அதனை கிறித்தவ நாடக ஆசிரியர்கள் விழிப்புணர்வு சிந்தனைகள் வழிஎடுத்துரைத்து சமுதாய மாற்றத்திற்கான ஆற்றலாகப் பயன்படுத்தியுள்ளனர் என்பதை அறிவுறுத்துவதாக இக்கட்டுரை அமைந்துள்ளது.

தொகுப்புரை

சமூக எழுச்சியுடைய ஒவ்வொருபடைப்பாளனும் மக்களை விழிப்படையச் செய்யத் தம் படைப்புத் திறமையைப் பயன்படுத்துகிறான். அவ்வகையில் இலக்கியத் திறன்மிக்கப் படைப்பாளர்கள் நாடகங்கள் வழியாகச் சமுதாயம் விழிப்படைய தங்கள் கருத்துகளைப் பதிவு செய்துள்ளனர். இன்றைய சமுதாயச் சூழலில் ஒவ்வொரு மனிதனும் சமயம், இனம், அரசியல், என்ற போர்வைக்குள் முடங்கியே ஆகவேண்டும் என்ற அவலம் ஏற்பட்டுள்ளது. இவை அனைத்தும் சமுதாயத்தை நெறிப்படுத்துவதற்காகத் தோன்றியவை. இருப்பினும் இன்றைய சமுதாயத்தைச் சீர்குலைக்கும் கருவிகளாக இவை மாறிவிட்டன. இவற்றைப் பற்றி நடுநிலையோடு சமூகப் படைப்பாளர்கள் விழிப்புணர்வு சிந்தனைகளை நாடகங்கள் வழி எடுத்துரைத்துள்ளனர்.

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2HIDDEN REALITY OF EXISTENTIALISM AND ABSURDISM: WITH REFERENCE TO *THE FLOATING OPERA* OF JOHN BARTH'S

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ABSTRACT

This paper explains the living style of modern society not only in reality but also absurdities. People never convince with absurdity, rather always feel and support existence. Men have the curiosity to know about hidden realities. The uncertainties, the fights, the anger, the trauma and the laughing temper leads the protagonist in nihilistic despair that the protagonist Todd meet his life. Experiences in life always dominating many people in the century. John Barth never support the readers for his rendition. Human beings always interested in their hidden reality. In this novel he wanted to explain human existence with absurdism.

KEY WORDS: Hidden Reality, Existentialism, Absurdism, Theatre, Trauma.

INTRODUCTION

John Barth is famous for his post modern writings. His best novel *The floating Opera* is considered as a fiction of realism as well as absurdism. The hero Todd Andrew is a lawyer by profession. He felt that life is empty and no meaning at anytime. He always confirm and believe life as absurd one. He leads his whole life in this concept only. No one is ready to accept his life. Because it's a disappeared life. He hates his life and ready to spoil his life. He was not succeed in his own life. Instead he searched the real meaning in his life. He knows very well that there is no constant reason in his life of optimism. For this theme the novel reached high. It is the *magnum opus* of his many writings. All the characters were excellent in showing their narrative talents. They reveal their curiosity in perfect manner. The writing style of John Barth is filled with realistic tradition and human fashion. The formal life activities structure to established their connections with the informing principles of nihilism. The people worked together and left all sufferings and connections in the society. He rejected the moral and religious principles. He believed that one day life will reach high but

with many problems. So he couldn't have positive attitude. This clearly understand in his creative works. This paper explains about existentialism and absurdism in John Barth's work of art.

PERSONAL NARRATION

The protagonist of the novel *The Floating Opera* Todd Andrews is ready to commit suicide. He accepts to end his life in the form of suicide. At the same time he enjoys death too. On June 1937, he planned to commit suicide in his home itself. He is a such type of individual character. Life is not a independent activity. Rather it is a helping thought between each and everyone. Human being should enjoy every situation, whether it may be a pessimistic thought or optimistic thought. Every human beings thought should be based on opinions, decisions, emotions and behavioral thoughts. Basically Our life improves and apprehends with happy moments. The binary opposition of life enchanted in the life of Todd Andrews, order and disorder, happy and sad, rich and poor, big and small. His mind is always like a stream of consciousness, roaming from one to another in the life circle of human being. By seeing members in the society often jealous comes in his mind. Because though he belong to high class, he couldn't adjust the life with high class people. Like all human beings Todd enjoys his own viewpoint. He realizes that human intelligence always not steady. It moves and not fix in one point. There is no faith after life. They are ready to complete their life in this world. Ironically he confirm with his own viewpoint of absurdity.

REALITY

Human being should accept the reality. Otherwise he maybe called as animal. God has given six senses to human being. But Alas, he never uses the senses. He failed in decision- making sense "a kind of substitute bacteriological endocarditis" with "a tendency to myocardial infarction" (FO.5). As Todd remarks in the text like this," My whole life, at least a great part of it, has been directed toward a solution of a problem, or mastery of a fact" and this is real. He accept the reality in all situations. His mind and heart ready to accept the reality and conclude that, "There is no way to master the fact with which I live". (FO 16.226). People who belief in god never be sad. Instead they enjoy each and every moment with experiencing all events. From childhood to old age the characters are ready to accept their inheritance. Too much of anything is good for nothing.

The reality is permanent one in everyones life. It causes many things include positive and negative thinking. It proves Todd as a absent mind person. The value of life shows in

everyones life when they experienced . After he rejects suicide no one is ready to accept and recognise him. Because they experienced the character of Todd. Similarly he learn many languages, but unable to talk. That is the reality. Some critics mentions that he is like the animal being person. Manytimes being love with others and hating the same person. He is not having balanced mind and life. Todd comments, ” Nothing, to me, is so consistently, profoundly, earth shaking funny as we animals in the act of mating” (124). He says “the second of two unforgettable demonstrations of my animality Only confirms the way”.(124). Morality and experiences paves the way to lead his life as success.

RATIONAL CAUSE

This latter endeavour is represented in his inquiry into the cause of human act. Todd believes in rationality everywhere. But sometimes lost his peace and love behaving like a animal. Later he confirm that he should practice and show love towards everyone. Todd realizes and said “It doesn’t follow that because a goal is unattainable. One shouldn’t work toward its attainment” (218-219). He support to a principle of happiness in daily life and said “limited inconsistency in his daily habits”(125). To extent that Todd’s unorthodox and traditional behaviour reflects, in his words, “a philosophical position of mine, or at least a general practice”.

It is based on his understanding that there is no ultimate rational justification for these habits” (57). But his view of philosophy is “the habit of habit- breaking”(29) is also an idea of strength. “freedom in demonstrating his ability to impose a rational order on his existence through self- control and discipline” (125). He later realizes, “to hide my heart from my mind, and my mind from my heart”(223). Death or life, leads life with happy “to attribute to abstract ideas a life -or- death significance”(204). “Todd wears each mask sincerely” (106).“And each time, it did not take me long to come to believe that my current attitude was not only best for me, because it put me on some kind of terms with my heart, but best in itself. Absolutely”(24). Enjoying each and every moment of life is most important. Birth and death is considered as a entrance and exit of life. So we can compare our life with theatre.

PHILOSOPHICAL INSIGHTS

Todd affects very much in psychologically. So rejects his life and accept death. But because of his insightful thoughts and philosophical insights ready to avoid suicide. The seven stages of life comes into his mind and ready to learn many things from life. No he ready to act and enjoy in the blessed life. Life is for enjoyment, with sad and unhappy, no

one sustain the life. This text also clearly suggest about the original plan of god. God created this world and human being with the beautiful insight. With disobedience man lost the beautiful Eden Garden. There is no equivalence in the life of human being with God. It is a metaphysical thought. God created the human being with his own image and desire. The Floating opera is also leads in a beautiful flying World.

Men being the best in the creation of God, always motivating others. Shakespeare also mentions in his creative works, that men should accept the sustainability of world. God created the human being in his own image, so he must possess the philosophy of god too. In his writings he mentioned “One of the best Shakespearean actors in the U.S.A.!”.(234). In another place he explains that “Hamlet’s question is, absolutely, meaningless (251)”. For philosophical view George Eliot says, “preemptory and absolute, the human relation to it need not be fixed and categorical, it can be mercurial and improvisational”.(121).

EXISTENCE

Accepting hard things in easy method is one of the best method. It is mentioned as “a kind of gamesmanship which denies any human authenticity”(the corpse of the Dragon Notes on Post romantic Fiction 125). Learnig things from experience is also mentioned here. He is a independent person. Never depending others. But the self consciousness that guides Todd towards the understanding of life in effective manner. But many times it denies the validity of any action. As Frank Lentricchia remarks in another context. “This type of self - consciousness can lead only to paralysis and despair”.Todd reopens his enquiry and worry about his own life. He is always ready to continue his life with possibilities and comments of his own future. It occurred him in all situations. “He is very much afraid of animal”(52). He also worried in many situations. “What was this beast honestly ridden by a woman” (22). Sometimes he felt unprotection and unsecure. So his belief with the society flies away. The audience be the happy people for him. But unfortunately the situations lead him for finding existence. Hope with God and Hope with society never leads a happiness. That is the reason for him to trying suicide. But later He knows the importance life and drop this idea. So Existence is the most important one in human life

HUMAN SALVATION

It doesn’t explain the human salvation alone, rather explores the redumption of world. If God is absent in this world nothing may be happened. Human life without human salvation is a meaningless life. Jesus Came this world for the salvation of people. Existentialism leads

the people in the same way. In this text, Todd enquires about the human salvation. Whether it is possible to reach heaven. The human being should not commit suicide, if it happens there is no salvation. This is the main theme of the book. Human existence hides absurdity. In most places Tom leads his life as meaningless. Many times he attempted suicide and trying to close his life. Many times he interested in silly things like ice-cream. Author clearly focuses on affirming human existence. Many places Nietzsche asserts human existence. So salvation is needed for everyone

CONCLUSION

Todd's Life always be a systematic and valued one. He always accepts everyone in the society. His life is "Values less than absolute". "But that's another enquiry and another story"(FO 252). The life which he leads in this society is extra-ordinary. So his friends mentions that his life as the best. He recognised himself as the best in this world, in the later part of his life. Self confidence and self obedience plays a pivotal role in everyone's life. Systematic scheduled life is most important. Life is not only filled with philosophical elements but also existence and human salvation. Emotions, experience and everything disguise the negative thoughts and motivate life in positively.

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**BODINAYAKANUR AND ERASAKKNAYAKANURZAMINS: A JOURNEY
THROUGH THE AGES**

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ABSTRACT

Bodinayakanur and Erasakknakkanur, are historically significant regions in Theni district. They are deeply intertwined with the zamindari system, which once as a cornerstone of governance and rural administration during the colonial and pre-colonial eras. These Zamins not only wielded political influence but also played an essential role in shaping the region's cultural and economic identity. The Zamindars of Bodinayakanur and Erasakknakkanur were known for their administrative and patronage of local traditions. Under their administration these regions flourished, leaving behind a legacy of grand estates, historical landmarks and enduring folklore. Theni district was originally part of Maduria district. The zamins of ErasakkaNayakanur, Thevaram, Bodinayakanur, Periyakulam, Kombai and Kandamanur were located in Theni district. This article analyzes the Bodinayakanur and Erasakknakkanur Zamindars tracing their origins, key rulers, and legacies that continue to influence the local heritage today.

Key words: *Zamindari system, Bodinayakanur, Erasakkanayanur Zamindars, Historical view*

1. Introduction

Theni district, located in Tamil Nadu, has rich historical legacy shaped by its zamindars, who played a significant role in the region's development during the pre-Independence era. Originally part of the Madurai district, Theni became home to several prominent zamindari estates, each contributing to the cultural and socio several prominent zamindari estates, each contributing to the cultural and socio-economic fabric of the area. The zamindars of ErasakkaNayakanur, Thevaram, Bodinayakanur, Periyakulam, Kombai and Kandamanur were influential landlords who managed vast tracts of land and supported local communities through their patronage. Beyond their economic activities, the zamindars were also instrumental in preserving regional traditions and supporting temple construction, festivals, and educational initiatives. Their influence extended into politics, culture and

society leaving an enduring mark on Theni's history. The history of Bodinayakkanur and ErasakkaNayakkanur zamins, shedding light on their governance, contributions and lasting legacy in the district. The Zamindari estates of Bodinayakanur and Erasakknakkanur played a crucial role in shaping the socio-economic and political structure of the area. It was ruled by influential Zamindars, were pivotal centers of administration, trade and cultural activity. Each region reflects an era marked by royal patronage and agrarian reforms.

2. Origin and growth of the system

The term zamindar was derived from the Persian language, literally meaning (zamin=land, dar=possessor) an occupant of the land or a land-holder. Zamindari was the tract of land which was under the possession of the Zamindar. On the assumption of power in India, the British evolved a policy to make the revenue collector as the possessor of the Zamindari. By the Zamindari system, a settlement with the zamindar was made by the Regulation XXV of 1802. It recognized the zamindars as land-holders. It also viewed that each zamindari included all the lands, both waste and arable within its boundaries. Each estate was assessed in perpetuity and land revenue was fixed, payable in all seasons. All the villages in the zamindari were collectively assessed. The Zamindars were only collector of land revenue. In Theni district (earlier Maduri district) the existing poligars were transformed into Zamindars.

3. Formation of Palayakarar System

Palakkarar, or Poligar was the feudal title for a class of territorial administrative and military governors appointed by the Nayak rulers of South India (notably Vijayanagar Empire, Madurai Nayaks and the Kakatiya dynasty) during 16th 18th centuries. Krishnadeva Raya, the great Vijayanagar Emperor, had divided his empire. Nayaks were the vassals of the Vijayanagar ruler, Tamil country was divided into three Nayakship instead of rajyas, Visvanatha Nayaka was the first Nayaka of Madurai Kingdom. By his turn he introduced Palayakarars (Poligar) System in Madurai Kingdom with assistance of Dalavay Ariyanatha Mudhaliyar and divided his region into 72 Palayam. Each Palayams consisting of few villages and the area of territories was an un uniform. Basically, the Palayams were developed as military camps to support the Nayaka kings. Palayakarar were the subordinates of the Madurai Nayaks.

4. Bodinayakkanur Zamindari

Bodinayakanur is one of the taluks of Theni district, located in the foot hills of Western Ghats in TamilNadu. Bodinayakkanur was one of the ancient Zamindari of Madurai. It was extending over an area of 302 square kilometers. It was bounded on the north by the Palani Hills, on the west by the Travancore Hills on the other two sides by government villages in the erstwhile Periyakulam Taluk. The soil is generally red and sandy. The climate is cool and pleasant during the greater part of the year.

According to traditions of the family its original founder emigrated to this part of the land from Anantapur District of Andhra Pradesh early in the fourteenth century. The Rajakambalam Nayakar, a Telugu speaking migrated from Andhra Pradesh and settled in the western and Kongu regions of Tamil Nadu. They have referred to by many other names, including Kambalattar, Kambalattu Nayakar, Kodangi Naiken, Vegiliyar Silavar is the subsect of Rajakambalam Nayakars, who migrated from Kuthu Bellary (Now called Kotha Bellary) region, Andhra Pradesh due to Muslim invasion. They reached the southern parts of Madurai and settled first in Jakkampatti near Aundipatty, Theni district. Later moved to Silarpatti near Jambuliputhur, Theni district, and finally settled in Bodi Nayakanur regions. They are partially Telugu speaking Tamil community and they were initially led by Chakku Nayakar.

When the Raja of Travancore Poonaiattu Tampiran ruled this region, Chakku Nayak attracted the attention of the Raja by slaying a ferocious wild boar, for the destruction of which a prize was fixed. Chakku Nayak overcame it in a single combat and brought it half alive to the Raja. He was delighted with the prowess of the Nayak and conferred this estate upon him on the condition that 100 pon (gold piece) was to be paid to the Raja on each time of the succession of a new heir. This practice of giving presents to the Raja was observed till 1948. In return he received a gold bangle and other gifts. Chakku Nayak ruled Bodi Nayakanur region as an independent chieftain.

Rama Nayakar, Sakkana Nayakar, Bangaru Muthu Nayakar, Jaggu Muthu Nayakar became Zamindars. In 1487 Chila Bodi Nayak succeeded to the estate and attained fame by his personal strength and bravery. He overcame Mallkhan, an athlete who was the champion of Vijayanagar rule. Vishwanatha Nayak, the ruler of Madurai conferred fresh honour on him and directed his country the Madurai region. It became one of the palayams under the Nayaks of Madurai. After a chequered history, Dindigul fell into the hands of Hyder Ali, who

confiscated the estate in 1755. The British captured the province in 1790 and the palayam was restored to the poligar. Subsequently Tirumala Bodinayakkan nurtured acrimony and deterred the entry of Collector Wynch when he first came to the District. However, he repented for his act and the British effected Zamindari settlement with him by fixing seventy percent of the total income of the estate.

Bangaru Tirumalai Bodinayakkan, succeeded Thirumala Bodinayakkan. He reconstructed the Bodi Palace in Bodinayakanur and also raised Subramanyaswamy Temple. In 1882, Bangaru Tirumalai Nayakar expired and his legal heir Tirumalai Bodaiya Kamaraja Pandya Nayakar was a child. So, British Government administered the Zamin. The Prince came to power only after some time. Later British government took over the Zamin and the legal heirs remain with the name as Zamin family. He built an anaicut across the Kottungudi river at a cost of four lakh rupees and brought 4000 acres of wet land under cultivation. He died in 1862 leaving the Zamindari to Kamaraja Pandia Nayak, his three-year-old minor son who became major in 1879.

During this period, he was given education by an English tutor in Madurai. Subsequently accompanied by his tutor, he proceeded to Madras for his education. In 1880 his estate was recognised as the permanently settled zamindari and a *Sanad* was issued to him. Kamaraja Pandia Nayak died in 1889, leaving the estate to Kamulu Ammal, his young wife. She was noted for her charitable activities and carried out public services. She constructed many choultries and laid foundation for the Victorio Memorial elementary School and High School with liberal contribution.

In 1889 Kandasamy Nayakar, the cousin of the late Zamindar filed a suit against Kamulu Ammal and claimed the estate. In 1890 he was granted Dombacherry sub-division in consideration of his claim being relinquished. In 1896 another sub-division -Buthipuram was made and it was registered in the name of Vijaya DhanathipathyPandiya Nayak, another cousin of the late Zamindar. Kamulu Ammal died in 1921 and was succeeded by Kamaraja Pandya Nayak, son of Kandasamy Nayak. He served as a member of Madras Legislative Council from 1930-1938 and was a member of the legislative Assembly from 1938 till his death in 1941. Thereafter Rajah Pandya Nayakar succeeded to the Zamindari.

5. Bodinayakkanur Palace

Bodinayakanur Zamin palace is the historical place and it became the residence of zamindars of BodiNayakanurPalaiyapattuZamin. Bangaru Tirumalai (1849-1862) constructed

the Bodi Palace in Bodi Nayakanur. The walls of the BodinayakkanurZamin palace has the painted mural. The two rooms at the basement level are drawn with Ramayana mural paintings. The paintings are in extinct condition and peeling off due to changing weather conditions. The three stories palace resembles the architectural styles of Jodhpur Palace of Rajasthan and this structure is enclosed by huge perimeter wall.

The palace houses a vast Durbar hallLakshmi Vilasam hall, visitors hall, Ukkiranam(granary) or store room for paddy and other grains. The entrance or Acharavasal as well as the interiors are embellished with wooden sculptures. The mural paintings on the walls of the Durbal hall and Lakshmi Vilasam hallshowcase rare and unique depiction of scenes from the epic Ramayana. They indicate the fine arts traditions of RajakambalamNayakars of Tamil Nadu. The panel of paintings drawn side by side appear fresh and depicts Ramayana story. The Zamindars of Bodi NayakanurPalayapattu are the descendants of the tradition of sage KalaikottuMunivar. The paintings on Ramayana weddings reflects the rituals followed in Rajakambalam's wedding.

6. Erasakkanayakkanur Zamindari

The Zamindari of Erasakkanayakkanuris located about 10 miles away from Chinnamanur. where the field are beautiful. The Zamindari of Erasakkanayakkanur was situated on the south eastern part of the Periyakulam Taluk bounded on the both sides by Cumbum valley and Gantamanakkannur Zamindari. It consisted of five villages Erasakkanayakkanur,Kanniservaipatty, Chinna obulapuram, Appiyapatty and Veppampattyand had a total area of fifty nine square kilometers.This town was called Erra JagkaNayakanoor because of the reign of Erra JagkamaNayakar, later it became ErasakkaNayakkanur. It was otherwise called as Kaspah.

Palayakarars had to pay one third of the revenue from their area to the Madurai Nayak, one third of the revenue to military maintenance, and the other for their own expenses. So, they protected their area. During the time of war, they had to support to the Nayaks. Therefore, they build new villages, dams, ponds and temple in the respective areas. ErasakkaNaiyakkannur Zamin is one of the oldest Zamins of the integrated Madurai district.

Apart from that, road transport facilities were established for the first time during the reign of reign of Rani Mangammal of Madurai Nayak. All the Zamins under the rule of the Nayaka kings were connected by straight roads. VarusanaduKandamanur Zamin ErsakkaNayakkanur Zamin was connected by Chinnamanur route in 1689 during the reign of

Rani Mangammal. It is 13 kilometer distance from Varusanadu Kandamanur Zamin to Chinnamanur via ErsakkaNayakkanur. The name of this road is Rani Mangaammal Road.

ErsakkaNayakkanur was one of the palayams in Dindigul and was long time under assumption by the manager of Hyder Ali and Tipu Sultan before Col. Stuart's conquest of Dindigul in 1790. On the requisition of this area the Company recognized Muthu Algherry Nayak as the Poligar who was put in possession by Collector Hurdis. During this period, revenue settlement on the basis of Zamindari tenure was introduced in the estate.

In 1816 Chinna Gobala Nayak, little boy of eight years old, succeeded to the estate and died in 1835 without any issue. The Board of Revenue put it under the ownership of the senior widow Chinnammal to succeed her husband in 1836, She leased the estate to one Chokalinga Pillai for a period of nine years from 1848. She continued as Zamindarini till her death in 1853. It was claimed by Kadiriyasami Nayak, a distant male cousin of the husband of Chinnammal and by Virakannu Ammal, the daughter of the Zamindar through the second wife, Pappammal. The two parties filed suit and counter suit in the Court which went upto the Privy Council for final judgement.

In the meantime, the lease of the estate expired in 1857. As the two parties were waiting for final judgement, the government in 1858 sequestered the estate and managed it till 1863. The Privy Council confirmed the judgement of the lower court and Vikrakannu Ammal, the daughter of the late Zamindar, was put in possession of the Erasakkanayakkanur Zamindar. Virakkanu Ammal held the estate till 1881 and registered it for her only son Kathirvelusami Nayak. After a long period in Erasakkanayakkanur, a male became a Zamindar. He married Rajamanickam who was the daughter of Kandamanur Zamin. Unfortunately, he died in 1886 at a very age of twenty-three years. Akkulu Ammal, the senior widow of the deceased, succeeded to the estate. Rajamanickam continued to be the zamindarini till 1945. Kamarajendra Kathirvel Pandiyaru, Matiratnam are the successor and in-charge of Erasakkanayakkanur Zamindars

In 1920, there was a severe famine. The Zamindari Akkulu Ammal and Zamin officials only entered into an oral agreement with the farmer. However, no tax collection was waived. It caused a great uproar among the farmers. Diwan, Karnam and Natamai (head man of the Village) were responsible for the administration of the land. Compulsory taxation and arbitrary taxation by the authorities in the village of Rayappanpatti, bounded by the ErsakkaNayakkanur Zamin, created a conflict between the Zamin officials and the

farmers. Rayappanpatti is a fertile village, populated Catholic Udayar Community came from Carnatic region, settled there and named the place after their leader, Royappa Udayar. Rayappanpatti is located on the road from Uthamapalayam to Suruli Falls in Theni district. To divert the people, they conducted cockfights, goat fights and Jallikattu and diverted the people and attracted people's minds. Such heroic Jallikattu has become a popular sport to encourage and attract all the local people. People lost their minds in such games and forgot the exploitation and oppression of the Zamindars. Jallikattu, which is held every year during Pongal Celebration. It is very popular in ErasakkaNayakkanur Zamin.

7. Social life of Zamindars

The caste system formed the basis of social organization of the Zamindars which worked for the protection of their economic and social interest. The society in general was mostly conservative and customs and traditions formed their basis of social norms. Their dogmatic religious traditions and lack of social mobility on the basis of caste superiority reduced their cultural independence. In the religious festivals the zamindar was given an important place. Brahmins were not engaged as priest either by the Naiker or Anuppan in their domestic function.

The life in the palace was strongly religious featuring ceremonial functions. Before the assumption of the British rule, the Zamindars were military chieftains and they constructed forts and maintained armies. When the British took over the administration, their forts were dismantled and were relieved of their military service. In the changed circumstances, they were reduced to the position of rent collectors and their forts were converted into palatial buildings. The Zamindars constructed massive modern buildings by mobilizing the resources of the estate.

They began to lead a modern life. Their standard of living went up and their scale of expenditure increased. Influenced by the British way of life the Zamindars entrusted the Zamindari in the hands of the revenue official and tuned into luxurious life.

8. Abolition of Zamindari System

Lord William Bentinck recorded that he was dissatisfied with the creation of zamindaris because the zamindari system was not suitable to both interest of the Government and of the people. Most of the Zamindars of Dindigul, Madurai and Tirunelveli regions fell into arrears. The effect of over-assessment brought a severe drought. As a result, The Government was unable to implement the demands of rent on the ryots. On 15th May 1808,

The Government appointed Hodgson, the senior member of the Board of Revenue to inquire the practical problems of the system, Finally, Hodgson reported that that over assessment was the main cause for the failure of the Zamindari system. Thus, Zamindari system failed on many counts. The zamindari history of Theni district is a testament to its agrarian legacy, the influence of colonial policies and the resilience of local communities. Even the Zamindari system was officially abolished in Tamil Nadu in the mid-20th century with the implementation of the abolition of Zamindari Act(1948), in Theni district, the Zamindars wield social and religious influence. Till date people believe and receive blessings from the zamindar family.

8. Conclusion

Bodinayakanur and Erasakknakkanurzamins in Theni district shaped the region's socio-economic and cultural framework. Though the zamindari system had failed into history, its influence lingers in the form of architectural remnants, cultural practices, and the enduring stories passed down through generations. The legacy of Zamindars serves as a reminder of the region's resilience and adaptability, as it transitioned from feudal systems to modern governance while retaining its rich heritage.

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CONSTANT NEUTROSOPHIC GRAPHS AND ITS TYPES

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ABSTRACT:

Neutrosophic graph theory is a refined fuzzy theory which emerges to reduce the ambiguity and vagueness in present life. The application of neutrosophic graph and its properties on real-life events are much helpful in case of decision-making, mathematical models, molecular chemistry, etc. This paper has a clear and new discussion on constant and totally constant neutrosophic graph with some examples, which is based on each membership of the edges connected to vertices. A characterization of constant neutrosophic graph on cycle graph is analysed.

Also, some properties based on order, size and cut vertex is discussed in detail. The extension of this research is done with constant and totally constant neutrosophic graph of second type. Here, we establish the concept of constant function, order and size of neutrosophic graph and discuss about the properties and results on constant neutrosophic graphs of second type.

Keywords: Neutrosophic graph, Constant neutrosophic graph, Totally constant neutrosophic graph, Second type, Constant function.

AMS Subject Classification: 05C78.

1. Introduction

Euler invented the graph theory notion in 1736, through the solution given by him for the famous Konigsberg bridge problem. This enriched the idea of dealing with crisp and integer based entries in graph theory. But there exist a limitation in applying this theory with real world scenario, since there are some uncertainty in the final output. Zadeh[11] reviewed the existing set theory approaches and thereby enhanced with the fuzzy set concept, which is the generalized output of crisp set theory. Rosenfeld[7] developed fuzzy graph models by keeping the existing graphical procedure in mind. Further, Atanassov[1] has taken non-membership explicitly into consideration and introduced intuitionistic fuzzy sets (IFS). The extensions of IFS namely intuitionistic fuzzy sets of second type (IFSST), intuitionistic L-fuzzy sets (ILFS) and temporal intuitionistic fuzzy sets (TIFS) are also a part of his work. Parvathi and Karunambigai[5, 6] introduced intuitionistic fuzzy graphs (IFG) elaborately and analyzed its components. Also, they furnished constant and

totally constant intuitionistic fuzzy graphs. Further Nagoorgani and Shajitha Begum [4] came up with the degree of IFG and studied their properties. Sheik Dhavudh and Srinivasan[8] introduced the extension of IFG namely constant intuitionistic fuzzy graphs of second type (IFGST) and defined the degree, order and size of IFGST. Smarandache[9, 10] coined the neutrosophic set theory and further applied it was applied by Broumi[2] to generate neutrosophic graph components. Gomathi and Keerthika[3] applied the labeling conditions with the neutrosophic graphs and obtained some operational results.

An establishment of constant and totally constant property in neutrosophic graphs with some illustrations are done in this article. Also, these results are extended and checked for neutrosophic graphs of second type.

2. Preliminaries

Definition 2.1 [Ref.3] A Neutrosophic Graph(NG) is of the form $G=(V,E)$, where

- (i) $V = \{v_1, v_2, \dots, v_n\}$ such that $\mu_1 : V \rightarrow [0,1]$, $\sigma_1 : V \rightarrow [0,1]$ and $\nu_1 : V \rightarrow [0,1]$ denote the degree of truth, indeterminacy and false membership of the element $v_i \in V$, respectively, and $0 \leq \mu_1(v_i) + \sigma_1(v_i) + \nu_1(v_i) \leq 3$, for every $v_i \in V$, $(i=1,2,3,\dots,n)$,
- (ii) $E \subseteq V \times V$ where $\mu_2 : V \times V \rightarrow [0,1]$, $\sigma_2 : V \times V \rightarrow [0,1]$ and $\nu_2 : V \times V \rightarrow [0,1]$ are such that, $\mu_2(v_i, v_j) \leq \min[\mu_1(v_i), \mu_1(v_j)]$, $\sigma_2(v_i, v_j) \leq \min[\sigma_1(v_i), \sigma_1(v_j)]$, $\nu_2(v_i, v_j) \leq \max[\nu_1(v_i), \nu_1(v_j)]$ and $0 \leq \mu_2(v_i, v_j) + \sigma_2(v_i, v_j) + \nu_2(v_i, v_j) \leq 3$ for every $(v_i, v_j) \in E, (i, j = 1, 2, 3, \dots, n)$.

Definition 2.2[Ref.3] (Degree of a Vertex in NG)

Let $G=(V,E)$ is an NG then the degree of a vertex in G is denoted by $d(v)$ and defined as,

$$d(v) = [d_\mu(v), d_\sigma(v), d_\nu(v)]$$

where, $d_\mu(v) = \sum \mu_2(v, u)$, $d_\sigma(v) = \sum \sigma_2(v, u)$ and $d_\nu(v) = \sum \nu_2(u, v)$ for all $u, v \in V$ and $u \neq v$.

Definition 2.3[Ref.3] (Minimum Degree of NG)

Let $G=(V,E)$ is an NG then the minimum degree of G is denoted by $\delta(G)$ and defined as,

$$\delta(G) = [\delta_\mu(G), \delta_\sigma(G), \delta_\nu(G)].$$

where, $\delta_\mu(G) = \min\{d_\mu(v)/v \in V\}$, $\delta_\sigma(G) = \min\{d_\sigma(v)/v \in V\}$ and $\delta_\nu(G) = \min\{d_\nu(v)/v \in V\}$.

Definition 2.4 [Ref.3] (Maximum Degree of NG)

Let $G=(V,E)$ is an NG then the maximum degree of G is denoted by $\Delta(G)$ and defined as,

$$\Delta(G) = (\Delta_\mu(G), \Delta_\sigma(G), \Delta_\nu(G)).$$

where, $\Delta_\mu(G) = \max\{d_\mu(v)/v \in V\}$, $\Delta_\sigma(G) = \max\{d_\sigma(v)/v \in V\}$ and

$$\Delta_\nu(G) = \max\{d_\nu(v)/v \in V\}.$$

Definition 2.5[Ref.4] (Order of NG)

Let $G=(V,E)$ is an NG. Then the order of G is defined by,

$$O(G) = (O_{\mu}(G), O_{\sigma}(G), O_{\nu}(G)).$$

where, $O_{\mu}(G) = \sum \mu_1(v)$, $O_{\sigma}(G) = \sum \sigma_1(v)$ and $O_{\nu}(G) = \sum v_1(v)$ for all $v \in V$.

Definition 2.6[Ref.4] (*Size of NG*)

Let $G=(V,E)$ is an NG. Then the size of G is defined by,

$$S(G) = (S_{\mu}(G), S_{\sigma}(G), S_{\nu}(G)).$$

where, $S_{\mu}(G) = \sum \mu_2(v_i, v_j)$, $S_{\sigma}(G) = \sum \sigma_2(v_i, v_j)$ and $S_{\nu}(G) = \sum v_2(v_i, v_j)$ for all $v_i \neq v_j$.

Definition 2.7[Ref.3] (*Total Degree of a vertex*)

Let G be an NG . The total degree of a vertex $v \in V$ is defined as

$$td(v) = [\sum d_{\mu}(v) + \mu_1(v), \sum d_{\sigma}(v) + \sigma_1(v), \sum d_{\nu}(v) + v_1(v)], v_1 v_2 \in E$$

If each vertex of G has the same total degree (r_1, r_2, r_3) , then G is said to be an NG of total degree (r_1, r_2, r_3) or (r_1, r_2, r_3) - totally constant NG.

3. Constant Neutrosophic Graphs on a Cycle

Definition 3.1 (*Constant NG*)

Let $G : ((\mu_{1i}, \sigma_{1i}, \nu_{1i}), (\mu_{2ij}, \sigma_{2ij}, \nu_{2ij}))$ be an NG on $G^* : (V, E)$. If $d_{\mu}(v_i) = k_i$, $d_{\sigma}(v_j) = k_j$ and $d_{\nu}(v_i) = k_i$ for all $v_i, v_j, v_1 \in V$ that is called as (k_i, k_j, k_i) - constant NG (or) constant NG of degree (k_i, k_j, k_i) .

Theorem 3.2 Consider a neutrosophic odd cycle graph G . Then G is a constant NG iff (μ_2, σ_2, ν_2) is a constant function. **Proof:** If (μ_2, σ_2, ν_2) is a constant function say $\mu_2 = c_1$, $\sigma_2 = c_2$ and $\nu_2 = c_3$, for all $(v_i v_j) \in E$, then, $d_{\mu}(v_i) = 2c_1$, $d_{\sigma}(v_i) = 2c_2$ and $d_{\nu}(v_i) = 2c_3$ for every $v_i \in V$, So, G is a constant NG.

Conversely, suppose that G is a (k_1, k_2, k_3) -regular NG. Let $e_1, e_2, \dots, e_{2n+1}$ be the edges of G in that order. Let $\mu_2(e_1) = c_1$, $\mu_2(e_2) = k_1 - c_1$, $\mu_2(e_3) = k_1 - (k_1 - c_1) = c_1$, $\mu_2(e_4) = k_1 - c_1$, $\sigma_2(e_1) = c_2$, $\sigma_2(e_2) = k_2 - c_2$, $\sigma_2(e_3) = k_2 - (k_2 - c_2) = c_2$, $\sigma_2(e_4) = k_2 - c_2$ and $\nu_2(e_1) = c_3$, $\nu_2(e_2) = k_3 - c_3$, $\nu_2(e_3) = k_3 - (k_3 - c_3) = c_3$, $\nu_2(e_4) = k_3 - c_3$ and so on.

Therefore,
$$\mu_2(e_i) = \begin{cases} c_1, & \text{if } i \text{ is odd} \\ k_1 - c_1, & \text{if } i \text{ is even} \end{cases}$$
 and similarly for other memberships.

Hence $\mu_2(e_1) = \mu(e_{2n+1}) = c_1$. So, if e_1 and e_{2n+1} incident at a vertex v_1 , then $d_{\mu}(v_1) = k_1$, $d(e_1) + d(e_{n+1}) = k_1$, $c_1 + c_1 = k_1$, $2c_1 = k_1$, $c_1 = k_1$.

Remark 3.3 The above statement of theorem does not hold for totally constant NG.

Theorem 3.4 Consider a neutrosophic even cycle graph G . Then G is a constant NG iff either (μ_2, σ_2, ν_2) is a constant function or alternate edges have same membership values for each membership.

Proof: If either (μ_2, σ_2, ν_2) is a constant function or alternate edges have same membership values, then G is a constant NG.

Conversely, suppose G is a (k_1, k_2, k_3) - constant NG. Let e_1, e_2, \dots, e_{2n} be the edges of even cycle G in that order. Continuing in the same way as before theorem,

$$\mu_2(e_i) = \begin{cases} c_1, & \text{if } i \text{ is odd} \\ k_1 - c_1, & \text{if } i \text{ is even} \end{cases} \quad \text{and similarly for other memberships.}$$

If $c_1 = k_1 - c_1$, the (μ_2, σ_2, ν_2) is a constant function. If $c_1 \neq k_1 - c_1$, then alternate edges have same membership values.

Remark 3.5 The above statement of theorem does not hold for totally constant NG.

4. Constant Neutrosophic Graphs of Second Type

Definition 4.1

A Neutrosophic Graph of Second Type(NGST) is of the form $G = (V, E)$, where

(i) The functions $\mu_1 : V \rightarrow [0,1]$, $\sigma_1 : V \rightarrow [0,1]$ and $\nu_1 : V \rightarrow [0,1]$ denote the degree of truth, indeterminacy and false membership of the element $v_i \in V$, respectively, and $0 \leq \mu_1(v_i)^2 + \sigma_1(v_i)^2 + \nu_1(v_i)^2 \leq 3$, for every $v_i \in V, (i = 1, 2, 3, \dots, n)$,

(ii) The functions $\mu_2 : V \times V \rightarrow [0,1]$, $\sigma_2 : V \times V \rightarrow [0,1]$ and $\nu_2 : V \times V \rightarrow [0,1]$ are such that, $\mu_2(v_i, v_j) \leq \min[\mu_1(v_i)^2, \mu_1(v_j)^2]$, $\sigma_2(v_i, v_j) \leq \min[\sigma_1(v_i)^2, \sigma_1(v_j)^2]$, $\nu_2(v_i, v_j) \leq \max[\nu_1(v_i)^2, \nu_1(v_j)^2]$ and $0 \leq \mu_2(v_i, v_j)^2 + \sigma_2(v_i, v_j)^2 + \nu_2(v_i, v_j)^2 \leq 3$ for every $(v_i, v_j) \in E, (i, j = 1, 2, \dots, n)$.

Definition 4.2 (Constant NGST)

Let $G=(V,E)$ is an NGST . suppose $d_\mu(v_i) = k_i, d_\sigma(v_j) = k_j$ and $d_\nu(v_l) = k_l$ for all $v_i, v_j, v_l \in V$ then the graph G is called an constant NFGST of degree (k_i, k_j, k_l) or (k_i, k_j, k_l) -constant NGST.

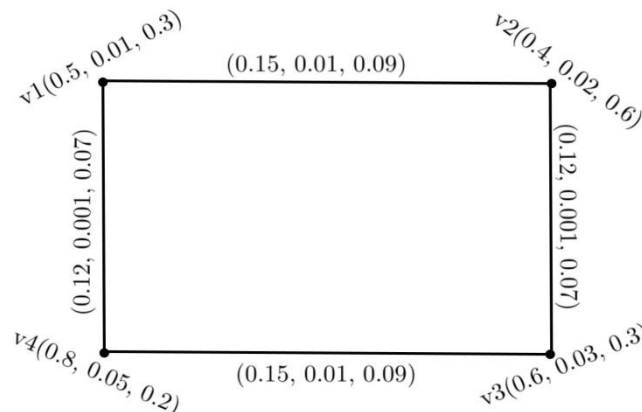


Figure 1: (0.27,0.011,0.16)-Constant NGST

Remark 4.3

Suppose G is a constant NGST of degree (k_i, k_j, k_l) iff $\delta = \Delta = (k_i, k_j, k_l)$.

Definition 4.4 (Totally constant NGST)

Let $G=(V,E)$ is an NGST .The total degree of a vertex $v \in V$ is defined as

$$td(v) = [\sum d_{\mu_2}(v) + \mu_1(v), \sum d_{\sigma_2}(v) + \sigma_1(v), \sum d_{v_2}(v) + v_1(v)], v_1 v_2 \in E$$

Suppose that each vertex of G has the same total degree (r_1, r_2, r_3) , then G is said to be an NGST of total degree (r_1, r_2, r_3) or (r_1, r_2, r_3) - totally constant NGST.

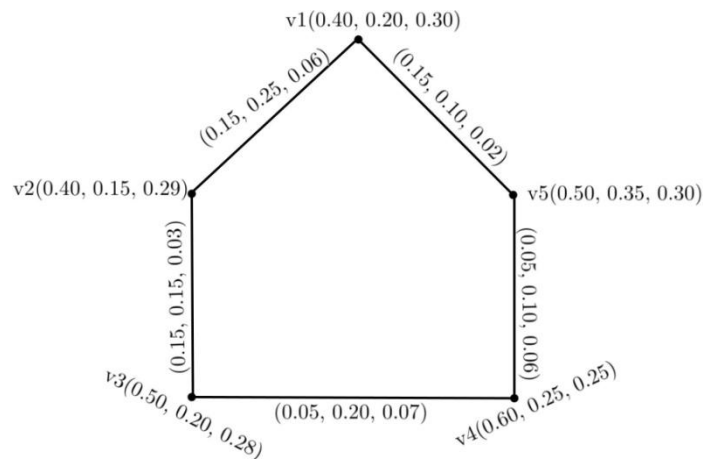


Figure 2: $(0.7, 0.55, 0.38)$ -Totally constant NGST

Definition 4.5 (Constant function)

Let $G=(V,E)$ is an NGST then (μ_1, σ_1, v_1) is said to be a constant function if each vertex of G have the same triplet of truth, indeterminacy and false degrees.

Theorem 4.6

Let $G=(V,E)$ is an NGST. If (μ_1, σ_1, v_1) is a constant function iff the following are equivalent:

- (i) G is a constant NGST.
- (ii) G is a totally constant NGST.

Proof:

(i) implies (ii)

Suppose that (μ_1, σ_1, v_1) is a constant function.

Let $\mu_1(v_i) = c_1, \sigma_1(v_i) = c_2$ and $v_1(v_i) = c_3$, for all $v_i \in V$, where c_1, c_2, c_3 are constants.

Assume that $G=(V,E)$ is a constant NGST of degree (k_1, k_2, k_3) then, $d_{\mu}(v_i) = k_1, d_{\sigma}(v_i) = k_2$ and $d_v(v_i) = k_3$ for all $v_i \in V$.

By the definition of totally constant NGST, $td_{\mu}(v_i) = d_{\mu}(v_i) + \mu_1(v_i), td_{\sigma}(v_i) = d_{\sigma}(v_i) + \sigma_1(v_i), td_v(v_i) = d_v(v_i) + v_1(v_i). \Rightarrow td_{\mu}(v_i) = k_1 + c_1, td_{\sigma}(v_i) = k_2 + c_2, td_v(v_i) = k_3 + c_3$ for all $v_i \in V$.

Therefore, G is a totally constant NGST.

(ii) implies (i)

Assume that G is totally constant NGST of degree (r_1, r_2, r_3) then we have, $td_\mu(v_i) = r_1$, $td_\sigma(v_i) = r_2$, $td_\nu(v_i) = r_3$ for all $v_i \in V$.

$$\Rightarrow d_\mu(v_i) + \mu_1(v_i) = r_1, d_\sigma(v_i) + \sigma_1(v_i) = r_2, d_\nu(v_i) + \nu_1(v_i) = r_3. \Rightarrow d_\mu(v_i) = r_1 - \mu_1,$$

$$d_\sigma(v_i) = r_2 - \sigma_1, d_\nu(v_i) = r_3 - \nu_1.$$

Therefore G is a constant NGST.

Conversely, assume that (i) and (ii) are equivalent. We will prove that (μ_1, σ_1, ν_1) is a constant function.

Suppose that it is not true then at least one pair of vertices satisfies, $\mu_1(v_1) \neq \mu_1(v_2)$,

$$\sigma_1(v_1) \neq \sigma_1(v_2), \nu_1(v_1) \neq \nu_1(v_2) \text{ for some } v_1, v_2 \in V.$$

Let G be a constant NGST of degree (k_1, k_2, k_3) then, $d_\mu(v_1) = d_\mu(v_2) = k_1$, $d_\sigma(v_1) = d_\sigma(v_2) = k_2$ and $d_\nu(v_1) = d_\nu(v_2) = k_3$, for some $v_1, v_2 \in V$.

$$\text{So, } td_\mu(v_1) = d_\mu(v_1) + \mu_1(v_1), td_\mu(v_2) = d_\mu(v_2) + \mu_1(v_2). \Rightarrow td_\mu(v_1) = k_1 + \mu_1(v_1), td_\mu(v_2) = k_1 + \mu_1(v_2).$$

Similarly, we have,

$$\Rightarrow td_\sigma(v_1) = k_2 + \sigma_1(v_1), td_\sigma(v_2) = k_2 + \sigma_1(v_2).$$

$$\Rightarrow td_\nu(v_1) = k_3 + \nu_1(v_1), td_\nu(v_2) = k_3 + \nu_1(v_2).$$

$$\text{So } \mu_1(v_1) \neq \mu_1(v_2), \sigma_1(v_1) \neq \sigma_1(v_2), \nu_1(v_1) \neq \nu_1(v_2).$$

Finally, we have G is not a totally constant and which is a contradiction to our assumption.

Hence (μ_1, σ_1, ν_1) is a constant function.

Theorem 4.7

Let $G = (V, E)$ be an NGST. If G is both constant and totally constant then (μ_1, σ_1, ν_1) is a constant function.

Proof:

Let G be a constant NGST of degree (k_1, k_2, k_3) and totally constant NGST of degree (r_1, r_2, r_3) .

We have, $d_\mu(v_i) = k_1$, $d_\sigma(v_i) = k_2$ and $d_\nu(v_i) = k_3$ for all $v_i \in V$. Also, $td_\mu(v_i) = r_1$,

$$td_\sigma(v_i) = r_2, td_\nu(v_i) = r_3 \text{ for all } v_i \in V.$$

$$\Rightarrow d_\mu(v_i) + \mu_1(v_i) = r_1, d_\sigma(v_i) + \sigma_1(v_i) = r_2 \text{ and } d_\nu(v_i) + \nu_1(v_i) = r_3.$$

$$\text{We have, } \mu_1(v_i) = r_1 - k_1, \sigma_1(v_i) = r_2 - k_2 \text{ and } \nu_1(v_i) = r_3 - k_3 \text{ for all } v_i \in V.$$

Hence (μ_1, σ_1, ν_1) is a constant function.

Theorem 4.8

The size of a constant NGST of degree (k_1, k_2, k_3) is $(\frac{pk_1}{2}, \frac{pk_2}{2}, \frac{pk_3}{2})$ where p is the number of vertices of a graph.

Proof:

We know that the size of NGST $G = [V, E]$ is

$$S(G) = [\sum \mu_2(v_i v_j), \sum \sigma_2(v_i v_j), \sum \nu_2(v_i v_j)] \text{ for all } v_i, v_j \in V, v_i, v_j \in E.$$

Since G is constant NGST of degree (k_1, k_2, k_3) , we have $d_\mu(v_i) = k_1$, $d_\sigma(v_j) = k_2$ and $d_\nu(v_l) = k_3$, for all $v_i, v_j, v_l \in V$.

But $\sum d_G(v_i) = 2[\sum \mu_2(v_i v_j), \sum \sigma_2(v_i v_j), \sum \nu_2(v_i v_j)]_{v_i, v_j \in E}$

$v_i, v_j \in E (\sum k_1, \sum k_2, \sum k_3) = 2S(G)$, $v_i \in V v_j \in V v_l \in V$

$(pk_1, pk_2, pk_3) = 2S(G)$

$(\frac{pk_1}{2}, \frac{pk_2}{2}, \frac{pk_3}{2}) = S(G)$

Theorem 4.9

Let $G = (V, E)$ be an NGST. If G is a totally constant NGST of degree (r_1, r_2, r_3) then $2S(G) + O(G) = (pr_1, pr_2, pr_3)$ where p is the number of vertices of a graph.

Proof:

$td_\mu(v_i) = d_\mu(v_i) + \mu_1(v_i)$, $td_\sigma(v_i) = d_\sigma(v_i) + \sigma_1(v_i)$, $td_\nu(v_i) = d_\nu(v_i) + \nu_1(v_i)$, for all $v_i \in V$.

$\Rightarrow \sum td_\mu(v_i) = \sum d_\mu(v_i) + \sum \mu_1(v_i)_{v_i \in V}$

$\sum td_\sigma(v_i) = \sum d_\sigma(v_i) + \sum \sigma_1(v_i)_{v_i \in V}$

$\sum td_\nu(v_i) = \sum d_\nu(v_i) + \sum \nu_1(v_i)_{v_i \in V}$.

$\Rightarrow pr_1 = 2S_\mu(G) + O_\mu(G)$, $pr_2 = 2S_\sigma(G) + O_\sigma(G)$ and $pr_3 = 2S_\nu(G) + O_\nu(G)$.

$\Rightarrow (pr_1, pr_2, pr_3) = 2(S_\mu(G), S_\sigma(G), S_\nu(G)) + (O_\mu(G), O_\sigma(G), O_\nu(G))$. $\Rightarrow (pr_1, pr_2, pr_3) = 2S(G) + O(G)$.

Theorem 4.10

If G is a constant NGST of degree (k_1, k_2, k_3) and totally NGST of degree (r_1, r_2, r_3) then $O_\mu(G) = p(r_1 - k_1)$, $O_\sigma(G) = p(r_2 - k_2)$ and $O_\nu(G) = p(r_3 - k_3)$.

Proof:

From the theorem 3, we have,

$2S_\mu(G) = pk_1$, $2S_\sigma(G) = pk_2$ and $2S_\nu(G) = pk_3$

and from theorem 4, we have

$2S_\mu(G) + O_\mu(G) = pr_1$,

$2S_\sigma(G) + O_\sigma(G) = pr_2$ and

$2S_\nu(G) + O_\nu(G) = pr_3$

$\Rightarrow O_\mu(G) = pr_1 - 2S_\mu(G)$, $O_\sigma(G) = pr_2 - 2S_\sigma(G)$ and $O_\nu(G) = pr_3 - 2S_\nu(G)$

$\Rightarrow O_\mu(G) = pr_1 - pk_1$, $O_\sigma(G) = pr_2 - pk_2$ and $O_\nu(G) = pr_3 - pk_3$

$\Rightarrow O_\mu(G) = p(r_1 - k_1)$, $O_\sigma(G) = p(r_2 - k_2)$ and $O_\nu(G) = p(r_3 - k_3)$

5. Conclusion

A clear representation of constant neutrosophic graph and a brief discussion on its type has been illustrated with some properties based on degree and total degree. Our future insight is to explore more results based on neutrosophic theory and its elemental properties on various graph structures.

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GREEN SYNTHESIS OF ZINC OXIDE NANOPARTICLES USING TOCOMA STANS YELLOW BELLS FLOWER EXTRACT AND ITS ANTIBACTERIAL ACTIVITY

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ABSTRACT

In our work, Zinc oxide nanoparticles were synthesized by the green synthesis method. Zinc acetate dihydrate used as a precursor and Tocoma stans yellow bell flowers extract used as a reducing agent. The crystallite size of synthesized zinc oxide nanoparticles confirmed from X - Ray Diffraction (XRD) and its chemical composition analyzed by Fourier Transform Infrared Spectroscopy (FTIR). The antibacterial activities of zinc oxide nanoparticles tested on S.aereus and E.Coli bacteria.

Keywords: ZnO nanoparticles, Tocoma stans yellow bell flowers and Antibacterial activity.

1. Introduction

In recent years metal oxide nanoparticles have emerged as a promising material due to its unique physical, chemical and biological properties [1]. These nanoparticles synthesized by the following methods such as physical, chemical, and biological methods in the range of 1 to 100nm [2]. Many researchers have desired to synthesis metal and metal oxide nanoparticles using greener technologies [3]. Green synthesis is a simple, low cost, less toxicity and an eco-friendly method to synthesis metal oxide nanoparticles [4].

Zinc oxide nanoparticles widely used in several fields such as corrosion inhibition, biomedical, drug discovery, energy, water treatment through photocatalytic process due to its optical and chemical properties [5, 6]. Green synthesis method used various parts of the plant extracts as reducing agent such as Myrtus Communis, *Euphorbia stricta*, Citrus aurantifolia, Nigella Sativa for efficient synthesis of nanoparticles [7 - 11].

2. Material and Methods

2.1. Materials

All the materials and chemicals were purchased from Modern Scientific Company, Madurai. Fresh Tocoma stans yellow bells flower were collected from Jayaraj Annapackiam College for Women campus, Periyakulam.

2.2. Preparation of *Tocoma stans* yellow bell flower extract

Fresh *Tocoma stans* yellow bell flowers collected and washed with tap water followed by distilled water. These flowers dried naturally, crushed into powder. The flower extract was prepared by adding five grams of *tocoma stans* yellow bell flower powder into 100 ml of distilled water and boiling for 30 minutes. The mixture was filtrated through Whatmann filter paper and the extract preserved for further use.

2.3. Synthesis of Zinc Oxide Nanoparticles

0.01 M of Zinc acetate dihydrate added into the 40ml of flower extract. The mixture was stirred for one hour at 80°C and then kept at room temperature over the night. The obtained precipitate was centrifuged and washed with distilled water then dried in an oven at 100°C for 30 minutes. The fine powder obtained the aid of mortar and pestle.

2.4. Characterization

The diffraction pattern of as synthesized ZnO nanoparticles studied using X-ray diffractometer (Rigaku miniflex II). The functional group of as synthesized ZnO nanoparticles studied using FTIR spectrometer (Perkin-Elmer 1725X).

3. Result and Discussion

3.1 XRD Analysis

The diffraction pattern of the synthesized ZnO nanoparticles carried out using X-ray diffractometer (Rigaku miniflex II). Fig.1 showed the diffraction pattern of the synthesized ZnO nanoparticles. It exhibited strong diffraction peaks at 27.06°, 35.07°, 54.02° corresponding to (110), (101), (211) planes respectively. All peaks are good agreement with standard spectrum (JCPDS: 89-0511). Using Debye-Scherrer formula, the average crystallite size of the synthesized ZnO nanoparticles was calculated.

$$d = \frac{K\lambda}{\beta \cos\theta}$$

Where, *d* is the average crystallite size, *K* is 0.89, λ is the wavelength of used X-ray light, β is the full width at half maximum and θ is the Bragg angle [12]. The average crystallite size of the synthesized ZnO nanoparticles was calculated to be 50nm.

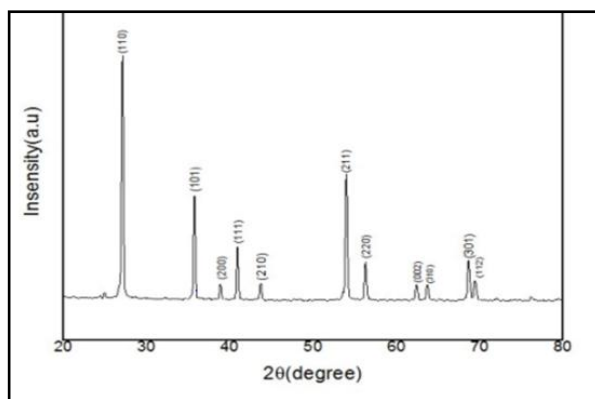


Fig.1. XRD patterns of ZnO nanoparticles

3.2 FTIR Analysis

The chemical composition of the synthesized ZnO nanoparticles was studied by using FTIR spectrometer (Perkin-Elmer 1725X). Fig.2 showed the FTIR spectra of the synthesized ZnO nanoparticles. The peak in the range 1566 cm^{-1} was corresponding to C–C stretching, 1411 cm^{-1} was corresponding to C–H stretching, 1025 cm^{-1} was corresponding to C–O stretching, and 656 cm^{-1} was corresponding to Zn–O vibration stretching [13].

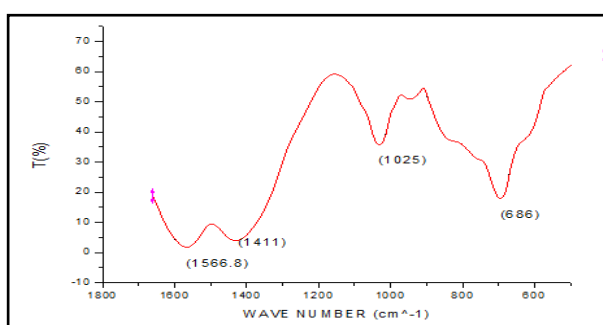


Fig.2. FTIR spectra of ZnO nanoparticles

3.3. Antibacterial Activity

Fig. 3 showed the antibacterial activity synthesized ZnO nanoparticles using agar diffusion disc method against *S.aereus* and *E.coli* bacteria. The antibacterial potential of ZnO nanoparticles against bacteria listed in Table 1.

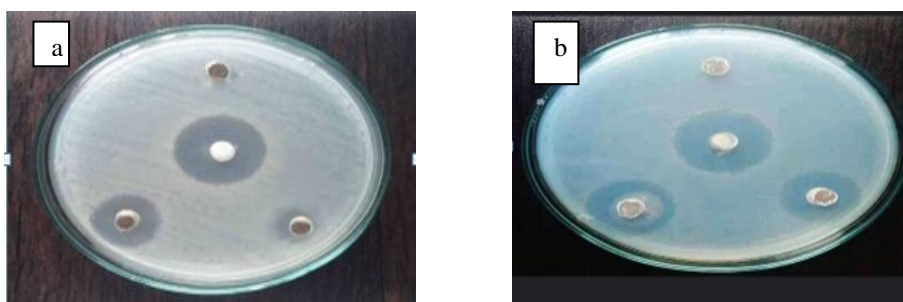
Fig.3. Antibacterial activity of ZnO nanoparticles against a) *S.aereus* and b) *E.coli*

Table 1: Antibacterial activity of ZnO nanoparticles

S.No	Pathogenic bacteria	Zone of inhibition (mm)			Standard (Amoxicillin)
		10 ug	20 ug	30 ug	
1.	S.aereus	07	10	13	22
2.	E.coli	07	12	14	22

4. Conclusion

Zinc Oxide nanoparticles synthesized using *Tocoma stans* yellow bell flowers extract through green synthesis method. The crystallite size of zinc oxide nanoparticles was 50nm calculated from XRD spectra and its Zn-O vibration stretching confirmed by FTIR. Finally ZnO nanoparticles showed as an effective antibacterial agent against *S.aereus* and *E.coli* bacteria.

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SYNTHESIS, CHARACTERIZATION AND BIOLOGICAL STUDIES OF CHALCONE BASED LIGAND AND ITS Co(II), Ni(II) AND Cu(II) COMPLEXES

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ABSTRACT

Heterocyclic compounds are an important compounds in the field of pharmaceutical and synthetic organic chemistry. The chalcone was synthesized by the reaction with 4-chloro benzaldehyde with o-Hydroxy acetophenone and 50% sodium hydroxide. Schiff base ligand (PCMBNT) was synthesized by the condensation reaction of 2-amino 6-nitro Benzothiazole with Chalcone. The Chalcone Schiff base ligand contain -C=N linkage, which exhibits various activities like antimicrobial, anticancer, antioxidant and antidiabetic activities. The structure of the synthesized ligand was confirmed by NMR and mass spectra and its Co(II), Ni(II) and Cu(II) complexes were characterized by elemental analysis and spectral analysis such as UV-Visible, FT-IR and ESI mass. The electronic absorption spectra of the complexes indicate tetrahedral geometry. The in vitro antibacterial and antifungal activities of the synthesized ligand and its Co(II), Ni(II) and Cu(II) complexes were screened against bacterial species (Staphylococcus aureus, Salmonella typhi, Escherichia coli, Bacillus subtilis) and Fungi (Candida albicans, Aspergillus niger) using well diffusion method.

Key words: Chalcone Compound, 2-Amino-6-nitro Benzothiazole, Schiff base, FT-IR,

1. Introduction

Schiff bases have emerged as the most preferred compounds in the field of coordination chemistry and medicinal chemistry. The azomethine group of Schiff bases makes it a potential donor for the formation of complexes. Besides the chelating ability of Schiff bases of heterocyclic compounds containing 5- and 6-membered rings, they also find potential applications in the field of therapeutics [1]. Benzothiazole is a privileged bicyclic ring system with significant biological properties, such as antimicrobial and anticancer [2,3].

Transition metal complexes of Schiff bases of 2-amino-6-nitrobenzothiazole enabled a study of the different ligation behaviors of Schiff bases. Metal complexes of chalcone-based Schiff bases exhibit diverse biological activities, including antioxidant, antimalarial effects [4], antitubercular [5] and antibiotic [6]. The aim of this work is to synthesize and characterize transition metal (II) complexes of Chalcone with 2-amino 6-nitro Benzothiazole.

2. Experimental

All the chemicals used in the present work, viz 2-amino 6-nitro Benzothiazole, *o*-Hydroxy acetophenone, 4-chloro benzaldehyde, Copper (II), Nickel (II) and Cobalt (II) acetates were purchased in analytical reagent grade. Commercial solvents were distilled and then used for the preparation of the ligand and its metal (II) complexes. The IR spectra were recorded on SHIMADZU FT-IR Affinity-spectrophotometer in the 4000–400 cm^{-1} range using KBr pellets. The NMR spectra were recorded on a Bruker DRX -300 MHz NMR spectrometer in DMSO (*d*₆) and CDCl_3 as solvents with tetramethylsilane (TMS) as the internal reference. ESI mass spectrum was recorded for ligand and its metal (II) complexes. The absorption spectra were recorded using a SHIMADZU 1800 spectrophotometer between 200-1100 nm by using suitable solvent. Magnetic susceptibility measurements of the complexes were realized by a Gouy balance using copper sulfate pentahydrate as the calibrant.

2.1. Synthesis of Chalcone Based ligand

2.1.1. Synthesis of Chalcone

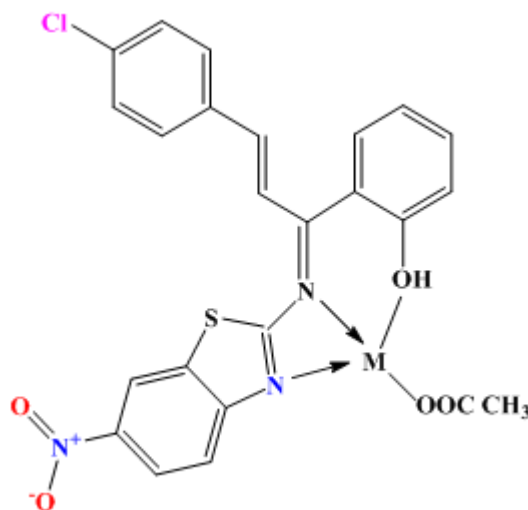
The chalcone was synthesized by the reaction with 4-chloro benzaldehyde with *o*-Hydroxy acetophenone and 50% sodium hydroxide at below 5°C, as a yellow solid. The solid was purified using petroleum ether.

2.1.2. Condensation

The chalcone ligand was synthesized by refluxing ethanolic solution of 2-amino 6-nitro Benzothiazole (3 g, 15 mM) with chalcone (4 g, 15 mM) for 5-6 hrs. The solution was allowed to stand at room temperature and the solid obtained was washed with petroleum ether. The solid was separated out and recrystallized and the yield was 70%. The scheme of the synthesis is given in **Scheme.1**

2.2. Synthesis of Co (II), Ni (II) and Cu (II) complexes

To the hot solution of chalcone ligand (Scheme.1) in ethanol, a solution of metal acetate (Co (II), Ni (II) and Cu (II)) in ethanol was added and refluxed with stirring for 4hrs. The solution was concentrated to one third of its volume and refrigerated for one day. A solid product obtained was filtered, washed with ethanol followed by petroleum ether and dried in vacuo.



M-Co (II), Ni (II), and Cu(II)

Fig.1 Proposed structure of metal (II) complexes.

2.3. Antimicrobial activity

The antimicrobial activity of the compounds was evaluated in vitro using the well diffusion method. This technique was employed against bacterial strains including *S. aureus*, *E. coli*, *S. typhi*, *B. subtilis*, and fungal species such as *C. albicans* and *Aspergillus niger*. The bacterial cultures were incubated in nutrient broth at 37 °C for 24 hours, while the fungal isolate was incubated in PDA broth at 28 °C for 2 to 3 days. Wells with a diameter of 5 mm were created in Muller–Hinton agar using a cork borer. The test solution, prepared at a concentration of 10^{-3} mol L⁻¹ in DMSO, was introduced into each well (100 µL per well). The plates were then incubated for 24 hrs at 37 °C, and the clear inhibition zones around the wells were observed. Amikacin and *Nystatin* served as standard drugs for antibacterial and antifungal testing, respectively.

3. Results and Discussion

The synthesized chalcone based ligand and its metal (II) complexes are in good agreement with their experimental data as given in **Table 1**. The composition of the Co (II),

Ni (II) and Cu (II) complexes was found to be 1:1 (metal/ligand ratio) and the structure is depicted in Fig.2. All the complexes are stable at room temperature. The complexes are insoluble in ethanol and water but soluble in DMSO and acetonitrile.

Table 1 : Physical characterization and analytical data of the ligand and its metal (II) complexes.

Compound	Formula	Colour	FW g/mol -1	Calculated (Found) (%)						Λ_M : S cm ²
				C	H	N	S	Cl	M	
PCMBNT -HL	C ₂₂ H ₁₅ N ₃ O ₃ SCl	Yellow	436	60.55 (60.23)	3.44 (3.14)	9.63 (9.33)	7.34 (7.01)	8.12 (8.01)	-	-
Co[L(CH ₃ COO)]	[C ₂₄ H ₁₇ N ₃ O ₅ S Cl] Co	Light Green	555	51.89 (49.99)	3.06 (2.99)	7.57 (7.47)	5.77 (5.55)	6.38 (6.02)	10.61 (10.41)	1.5
Ni[L(CH ₃ COO)]	[C ₂₄ H ₁₇ N ₃ O ₅ S Cl] Ni	Light Yellow	554	51.99 (50.11)	3.06 (2.98)	7.58 (7.33)	5.78 (5.58)	6.38 (6.11)	10.57 (10.67)	1.7
Cu[L(CH ₃ COO)]	[C ₂₄ H ₁₇ N ₃ O ₅ S Cl] Cu	Brown	557	51.71 (51.45)	3.31 (3.15)	7.54 (7.22)	5.75 (5.51)	6.36 (6.11)	11.40 (11.21)	2.5

3.1. IR Spectra studies

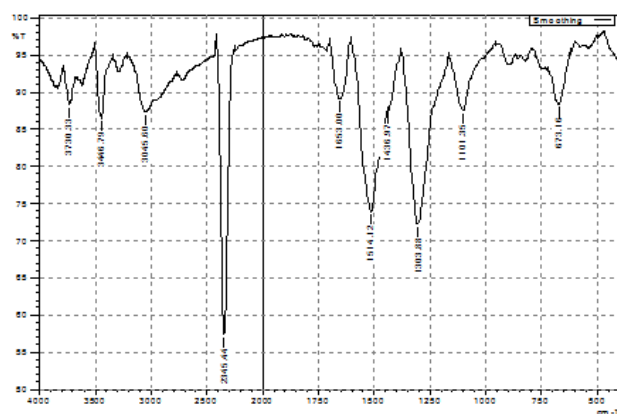
In order to study the binding mode of the Schiff base to the metal (II) ions, the IR spectrum of the free ligand was compared with the spectra of metal (II) complexes (Table 2). There were some significant differences between the metal (II) complexes and the free ligand upon chelation as expected. The IR spectrum of the free ligand showed characteristic bands at 1653, 1514, 1303 and 1101 cm⁻¹ assigned to $\nu(\text{C}=\text{N})$ azomethine, $\nu(\text{C}=\text{N})_{\text{thiazole}}$, $\nu(\text{C}-\text{O})_{\text{phenolic}}$ and $\nu_{\text{sym}}(\text{COO}^-)$ stretching modes, respectively. The $\text{C}=\text{N}$ band frequency is shifted to lower values (1653- 1649cm⁻¹) suggesting that the nitrogen of the azomethine group is coordinated to the metal ion [7, 8].

The thiazole ring nitrogen frequency values shifted to 1519-1504 cm⁻¹ indicates that $\nu(\text{C}=\text{N})_{\text{thiazole}}$ ring nitrogen is chelated to metal ion. In addition, the IR spectrum of the ligand displayed a distinct peak at 1303 cm⁻¹, corresponding to the phenolic C–O stretching. This frequency ranges shifted to 1300–1290 cm⁻¹, indicates the involvement of the phenolic oxygen in the coordination mode [9]. The $\nu_{\text{sym}}(\text{COO}^-)$ band frequency values shifted to 1116 -1095 cm⁻¹ indicates $\nu_{\text{sym}}(\text{COO}^-)$ acetate ion inferring the coordination to metal ion. Further evidence of coordination of the Schiff base with the metal (II) ion was shown by the

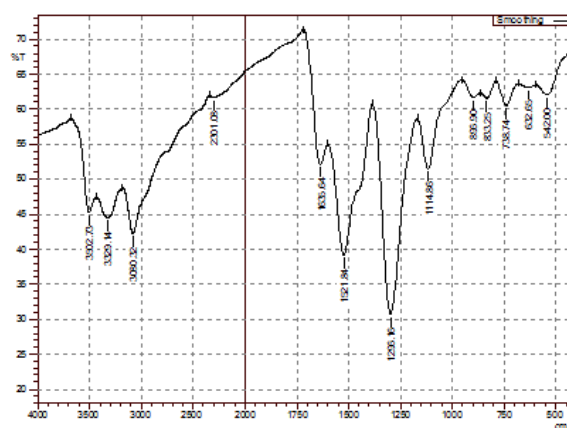
appearance of new absorption band at 675-615 cm⁻¹ and 542–430 cm⁻¹ due to metal-oxygen ν (M–O) vibrations and ν (M–N) vibrations respectively [10].

Table 2 : Characteristic IR stretching frequencies (cm⁻¹) of the ligand and its metal (II) complexes

Compounds	ν(C=N)	ν(C=N) thiazole	ν(C-O) phenolic	ν(COO ⁻)	ν(M-O)	ν(M-N)
PCMBNT –HL	1653	1514	1303	1101	-	-
Co[L(CH ₃ COO)]	1635	1521	1296	1114	632	542
Ni[L(CH ₃ COO)]	1645	1519	1290	1116	615	430
Cu[L(CH ₃ COO)]	1649	1504	1300	1095	675	466



PCMBNT –HL



Co[L(CH₃COO)]

Fig.2. IR Spectra of ligand and its Co[LCH₃COO]

3.2. Electronic spectra

The electronic spectral data, recorded in DMSO, reveals distinct absorption patterns for both the ligand and its metal (II) complexes, as shown in Table 3. The ligand exhibits two absorption bands at 352 nm and 286 nm, which can be attributed to the n→π* and π→π* transitions, respectively. The electronic spectrum of Cu (II) complex shows absorption at 15313 and 26666 cm⁻¹, which is assigned to ³A_{2g}(F) → ³T_{1g}(P) transitions and the magnetic moment value 1.34 B.M confirms the tetrahedral geometry. The bands at 16528 and 26666 cm⁻¹ assigned to ³A_{2g}(F) → ³T_{1g}(F) transitions and indicates the tetrahedral geometry of the Co (II) complex and the magnetic moment value 2.77 B.M confirms the same [15]. The magnetic moment value 4.06 B.M. for Ni(II) complex as well as the electronic spectrum

centered around 14903 and 26666 cm^{-1} assigned to ${}^4T_{1g}(F) \rightarrow {}^4A_{2g}(F)$ transitions, confirm tetrahedral geometry around the Ni(II) ion [11].

Table 3 : Electronic spectral data of ligand and metal (II) complexes

Compound	λ_{max} nm (cm^{-1})	Transition	Geometry	μ_{eff} (BM)
PCMBNT –HL	352 (28409) 286 (34965)	$n \rightarrow \pi^*$ $\pi \rightarrow \pi^*$	-	-
Co[L(CH ₃ COO)]	605 (16528) 375 (26666)	${}^3A_{2g}(F) \rightarrow {}^3T_{1g}(F)$	Tetrahedral	2.77
Ni[L(CH ₃ COO)]	671 (14903) 375 (26666)	${}^4T_{1g}(F) \rightarrow {}^4A_{2g}(F)$	Tetrahedral	4.06
Cu[L(CH ₃ COO)]	653 (15313) 375 (26666)	${}^3A_{2g}(F) \rightarrow {}^3T_{1g}(P)$	Tetrahedral	1.34

*-Intraligand charge transfer bands

3.3. ${}^1\text{H}$ and ${}^{13}\text{C}$ NMR spectra

The ${}^1\text{H}$ NMR spectrum of ligand recorded in deuterated DMSO shows signals coherent with suggested structure. The multiplets around 8.53-8.54 ppm are assigned to benzothiazole ring protons. The signal around at 7.26-7.58 ppm is referred to the -OH substituted aromatic ring protons. The signal around at 8.21-8.24 ppm indicates Cl substituted aromatic ring protons and the singlet at 5.513 ppm is assigned to alkenic proton of the Schiff base ligand.

In ${}^{13}\text{C}$ NMR spectra (C=N) of Benzothiazole ring shows a singlet at 76.70 - 77.33 ppm and azomethine carbon atom resonated as singlet at 102.37 ppm. [12]

3.4. Mass spectra

The mass spectra of the ligand and its Co(II), Ni(II), and Cu(II) complexes were recorded, and their stoichiometric compositions were analysed. The molecular ion peak for the ligand, L (C₂₂H₁₅N₃O₃SCl), was observed at 436 m/z. In contrast, the molecular ion peaks of the Co(II), Ni(II), and Cu(II) complexes appeared at 555, 554, and 557 m/z, respectively, confirming the stoichiometry of the metal complexes as [ML(CH₃COO)].

3.5. Antimicrobial activity

The in vitro antibacterial and antifungal activities were evaluated using the disc diffusion method. Amikacin and Nystatin served as positive controls for bacterial strains such as *S. aureus*, *E. coli*, *Salmonella typhi*, *B. subtilis*, and fungal species such as *C. albicans* and *Aspergillus niger*. The inhibition zones that developed after incubation are presented in Table 4. [13]. A comparative analysis of the inhibition zones for the ligand and its metal (II) complexes revealed that the metal complexes exhibited better antimicrobial activity than ligand alone. This increased activity of the complexes was explained by Overtone's concept, which suggested that the enhanced lipophilicity of the complexes facilitated their penetration through the microbial cell membrane, thereby increasing their effectiveness. [14].

Table 4 : Antimicrobial activity of the Schiff base ligand and its metal (II) complexes

Compounds	Antibacterial activity				Antifungal activity	
	<i>E.Coli</i>	<i>Salmonella typhi</i>	<i>Bacillus Subtilis</i>	<i>S.Aureus</i>	<i>C.Albicans</i>	<i>Aspergillus niger</i>
PCMBNT -HL	17	15	17	18.3	15	11
Co[L(CH ₃ COO)]	17.6	15.2	18	18	15.5	14
Ni[L(CH ₃ COO)]	18.1	16.2	17.5	18.6	16	12.4
Cu[L(CH ₃ COO)]	18	16	17.3	18.5	15.7	12
Standard	17	18	18	20	15	14

CONCLUSION

In this study, transition metal (II) complexes of a Schiff base derived from 2-amino 6-nitro Benzothiazole were synthesized and thoroughly characterized. Various analytical techniques including elemental analysis, UV-visible spectroscopy, NMR spectroscopy, IR spectroscopy, and ESI mass spectrometry were employed for characterization. Based on electronic spectra, mass and magnetic moment data, tetrahedral geometry was proposed for the metal (II) complexes. The metal (II) complexes exhibit good antimicrobial activity compared to the parent Schiff base ligand.

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A STUDY ON ANAEMIA IN RELATION AGE AMONG SCHOOL CHILDREN IN VAIGAIM, THENI DISTRICT

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ABSTRACT

Anemia is a major nutritional problem in India. Anemia in infancy and early childhood affects growth and development and is associated with increased morbidity and mortality. Adolescence is a formative period of life during which the maximum amount of physical, psychological, and behavioral changes take place in the human body. Therefore, the present study was designed to determine the prevalence, severity, and risk factors associated with anemia in adolescence. During adolescence, the requirement for nutrition and micronutrients is relatively high. As a result, adolescent females, especially those between the ages of 11–17 years, are more vulnerable to iron deficiency, as the body's metabolic requirements need more iron. This study will give special emphasis to addressing the problem of anemia in adolescent females.

INTRODUCTION

Blood is a liquid medium that supplies all the nutrients to the various parts of the body. Approximately 45% of the total volume of blood is composed of red blood cells, white blood cells, and platelets. The remaining 55% is the liquid portion, called plasma, which contains 90% water and 10% protein, carbohydrates, lipids, vitamins, hormones, enzymes, and salts (Brown, 1998).

The study of blood is called haematology, which also includes the study of the following aspects: physiology, pathology, clinical laboratory, along with diagnosis, treatment, and prevention.

The term "anaemia" is derived from the Ancient Greek word for "bloodlessness." Anaemia is a condition in which the blood cannot carry enough oxygen to meet the needs of the body.

Anaemia may be described biochemically in terms of lowered hemoglobin levels, the number of blood cells, and packed cell volume. Anaemia is caused not only by a deficiency of iron but also by many other nutrients like amino acids, vitamin B₁₂, folic acid, pyridoxine, copper, and vitamin E.

Anaemia is a global public health problem that affects both developing and developed countries. It is an indicator of poor nutrition and poor health, with major consequences for human health, as well as for the social and economic development of a population (WHO, 2008).

There are different types of anaemia, including hemorrhagic anaemia due to excessive blood loss, hemolytic anaemia due to red blood cell destruction, and hematopoietic anaemia due to reduced production of RBCs. There are many causes of anaemia, but deficiency is a common cause (Ullah *et al.*, 2013).

The anaemic patient usually complains of weakness, fatigue, lack of energy, and dizziness. Other symptoms include a haggard look, premature wrinkles, dull and tired-looking eyes, poor memory, shortness of breath on exertion, headache, slow healing of wounds, and palpitations. The skin and mucous membranes appear pale.

Anaemia is known to affect people of all age groups, particularly women of childbearing age and children. The World Health Organization (WHO) defines anaemia as follows: in children from 6 months to 5 years, anaemia is defined as a Hb level <11g/dl; in children between 5–11 years, Hb <11.5 g/dl. The most common cause is iron deficiency.

Iron-deficiency anaemia is the most prevalent nutritional disorder in the world, affecting both developed and developing countries. The World Health Organization has estimated that approximately 1.6 billion people (close to one-fourth of the world's population) have anaemia. Africa is the most affected region. Anaemia is most prevalent among pregnant women and children below five years of age, and it is particularly common during the first two years of life. Around 60% of African children below five years of age have anaemia (World Health Organization, 2005).

According to WHO data, 30% of children aged 0–4 years and 48% of children aged 5–14 years are anaemic in developing countries (World Health Organization, 2001). The prevalence of anaemia in Indonesia steadily declined among children, adolescents, women, and men, as assessed by the Indonesian Family Life Surveys (IFLS). Nevertheless, despite this progress, anaemia still remains a moderate public health problem in children under 12 years and in non-pregnant and pregnant women over 15 years, with prevalence ranging from 20–39.9%.

School health services play an important role in the development of every child by providing comprehensive care for the health and well-being of children during the school years. As health and education are intimately related, the advantages of health education can be best attained in the school. Health education should place more emphasis on preventing health problems rather than simply providing cures (Nigudi *et al.*, 2012).

OBJECTIVES

- To study the age-related changes among school children.
- To study the haematological parameters and clinical manifestations of anaemia.
- To correlate the haemoglobin levels.
- To raise awareness about anaemia among school children.

REVIEW OF LITERATURE

Bishwajit Ghose *et al.* (2016) conducted studies on the association between food insecurity and anaemia among women of reproductive age. Adolescence is a critical stage in the life cycle, during which the health of females is affected due to growth spurts, the onset of menstruation, poor iron intake due to poor dietary habits, and gender biases. About 75% of teenage girls do not meet their dietary requirements for iron, compared to only 17% of teenage boys (Bruno de Benoist *et al.*, 2015). A study conducted on the prevalence of iron deficiency anaemia among adolescent girls in 16 districts of India in 2006 showed that 90.1% of adolescent girls were exposed to moderate iron deficiency anaemia, and 71% of girls were exposed to severe iron deficiency anaemia (Nirmala *et al.*, 2011).

In the World Health Report by the World Health Organization, it was noted that the worldwide mortality rate due to iron deficiency anaemia was 60,404,000, and the mortality rate in India was 13,704,953 in 2005 (Nirmala *et al.*, 2011). A study conducted on women of reproductive age in a rural area showed that 55.8% of the participants had inadequate knowledge, while 44.2% had adequate knowledge about the prevention of iron deficiency anaemia.

Adolescence is defined by WHO as a person between the ages of 10-19 years. The world is home to 1.2 billion individuals aged 10–17 years (The State of the World's Children, 2011). In girls, adolescence marks the beginning of the menstrual or reproductive cycle. Adolescents gain 30% of their adult weight and more than 20% of their adult height between the ages of 10-19 years, a phase known as the growth spurt.

Dr. Sreedhar *et al.* (2016) conducted a study on anaemias in tribal children, a prospective study conducted at the University of Assam in Northeastern India, focusing on college-going girls. A total of 262 college-going girls (18-25 years of age) were included in the study. The high prevalence of iron deficiency in the developing world has substantial health and economic costs, including poor pregnancy outcomes, impaired school performance, and decreased productivity (Zimmermann *et al.*, 2007).

Nutritional iron deficiency anaemia (IDA) occurs when physiological requirements cannot be met by iron absorption from the diet. Low iron bioavailability in populations consuming monotonous, plant-based diets is another dietary factor contributing to IDA. Although iron deficiency is the most common cause of anaemia, deficiencies of other micronutrients (such as folate and vitamin B12) and factors like chronic infection and inflammation can cause different forms of anaemia or contribute to their severity. Since iron deficiency is often accompanied by deficiencies of other nutrients, the signs and symptoms of iron deficiency can be difficult to isolate.

A high prevalence of anaemia was found among adolescent girls, particularly in low economic strata. It was observed that anaemia affects the overall nutritional status of adolescent girls. The problems of adolescence are multidimensional in nature and require a holistic approach. Some of the problems faced by adolescents include anorexia nervosa, obesity, overweight, micronutrient deficiencies, emotional problems, behavioral problems, substance abuse, sexually transmitted diseases, and identity and study problems (Siddharam *et al.*, 2011).

MATERIALS AND METHODS

The present investigation was carried out to study the blood parameters in relation to anaemia in young girls with reference to age. A total of 150 individuals, aged 11 to 17 years, were considered and classified into 7 age groups.

Group 1	11yrs
Group 2	12yrs
Group 3	13yrs
Group 4	14yrs
Group 5	15yrs
Group 6	16yrs
Group 7	17yrs

These 150 individuals were studied at Government Higher Secondary School, Vaigaidam, Theni (District). Haemoglobin concentration, packed cell volume, total count, and body mass

index were considered, and the investigations were carried out. Mean corpuscular volume, mean corpuscular haemoglobin, and corpuscular haemoglobin concentration were also derived.

Most of the village school children were categorized as middle class or below the poverty line. Hence, anaemia was a major health problem in the adolescent age group. The present study, therefore, focused on students aged 11 to 17 years, studying from 6th to 12th standard.

SAMPLE POPULATION

A total of 150 individuals, aged 11 to 17 years, were considered and classified into 7 age groups (11, 12, 13, 14, 15, 16, 17). Blood samples were collected from students of Government Higher Secondary School, Vaigaidam.

SAMPLE

For haematological investigation, venous blood was preferred, which can be obtained from the antecubital vein. A tourniquet was applied to the upper arm, the vein was sterilized with 70% alcohol, and then a sterilized needle and syringe were used for blood collection. After sterilizing the vein, the needle and syringe were inserted at an angle of 23 degrees, and blood was withdrawn from the vein and transferred to a specific container with an anticoagulant. The tourniquet was then removed.

ANTICOAGULANT

A number of different anticoagulants are used to prevent blood from coagulating. Some of the common anticoagulants include disodium or dipotassium salts of EDTA, double oxalate (potassium and ammonium), trisodium citrate, and heparin. EDTA is the anticoagulant of choice for most haematological studies.

HAEMOGRAM

Blood, being a sensitive indicator of health, has been proposed for study in the present investigation to examine the blood parameters among school students with reference to different age groups.

The blood parameters typically investigated include haemoglobin, packed cell volume, and red blood cells, which are used to determine erythrocyte indices such as Mean Corpuscular Volume, Mean Corpuscular Haemoglobin, and Mean Corpuscular Haemoglobin Concentration.

HAEMOGLOBIN CONCENTRATION

Hemoglobin is an intensely colored protein, a property that can be used for concentration measurements. The purpose of estimating hemoglobin is to determine the oxygen-carrying

capacity of the blood. The result helps in detecting diseases that cause a deficiency or excess of hemoglobin.

The acid hematin method is used to determine the concentration of hemoglobin. It is a standard assay to measure hemoglobin. The hemoglobin is converted into acid hematin by diluting it with hydrochloric acid. The brown color of the compound is then matched with a brown glass standard in a comparator.

In a graduated hemoglobin tube, N/10 HCl is filled up to the 20 mark. To this, add 20 μ l of blood with the help of a hemoglobin pipette. Mix the acid hematin solution in the tube and let it stand for 10 minutes. Distilled water is then added drop by drop to dilute the brown solution of acid hematin, and it is stirred until the color matches that of the comparator. The reading is then taken in grams and percentage.

PACKED CELL VOLUME

Haematocrit, or packed cell volume, is the amount of packed red cells in the blood. Two methods are available for determining haematocrit: the microhaematocrit method and the macrohaematocrit method.

In a Wintrobe tube, fill the blood up to the 10 cm mark using a sterilized syringe and needle. Place the Wintrobe tube in a centrifuge for centrifugation. Centrifuge the tube for 30 minutes at 3000 rpm.

After 30 minutes, remove the Wintrobe tube and read the packed cell volume directly from the graduations on the tube. The packed cell volume is represented as a percentage.

TOTAL COUNT

For the measurement of red blood cells, the haemocytometer method is adopted, in which the RBC pipette and haemocytometer (Neubauer chamber) are rinsed with distilled water, 95% alcohol, and then with acetone. The counting chamber and coverslips are cleaned using lens paper moistened with xylene.

The finger is cleaned with 70% alcohol and allowed to air dry. A single puncture is made in the fingertip using a sterilized needle. A drop of blood is then directly drawn into the pipette up to the 0.5 mark. After placing the blood to the 0.5 mark in the RBC pipette, wipe the tip clean and draw diluting fluid up to the 101 mark. Shake the solution for 3 minutes, then charge the chamber. Count the RBCs using a 40x objective lens in the 80 smallest squares as indicated in the diagram of the chamber. The red blood cell count is expressed as cells per cubic millimeter (cu.mm).

$$\text{RBC count} = \frac{\text{No. of cells counted} \times \text{Dilution factor} \times \text{Depth factor}}{\text{Area counted}}$$

RED BLOOD CELL INDICES

For the manual procedures, the numerical values mentioned above are calculated from the total number of red blood cells, haemoglobin, and haematocrit. These are referred to as indices. Three common indices are: Mean Corpuscular Volume (MCV), Mean Corpuscular Haemoglobin (MCH), and Mean Corpuscular Haemoglobin Concentration (MCHC). Another quantitative measurement of the red blood cells, called Mean Cell Diameter (MCD), is made directly under the microscope.

MEAN CORPUSCULAR VOLUME (MCV)

This is the average volume of red cells because the size of the cell is very small.

$$\text{MCV} = \frac{\text{Packed cell volume (\%)}}{\text{Red blood cell count in millions/cu.mm}} \times 10 \mu\text{m}^3$$

MEAN CORPUSCULAR HAEMOGLOBIN (MCH)

It is the average haemoglobin content (by weight) of red blood cells. Because the amount is very small, MCH is calculated using the following formula.

$$\text{MCH} = \frac{\text{Haemoglobin (g/dl)}}{\text{Red blood cell count in millions/cu.mm}} \times 10 \text{ pg}$$

MEAN CORPUSCULAR HAEMOGLOBIN CONCENTRATION (MCHC)

It is an expression of the average haemoglobin concentration per unit volume (100) of packed red cells. It is expressed in g/dl, which is the same as %. There are two formulae used in the calculation of MCHC.

$$\text{MCHC} = \frac{\text{Haemoglobin (g/dl)}}{\text{Packed cell volume (\%)}} \times 100 \%$$

STATISTICAL METHODS

The collected data was subjected to the following statistical analysis for interpreting the results.

i) Arithmetic Mean

Mean was calculated for various values. The results were computed using the following formula

$$\text{Arithmetic Mean } \bar{X} = \frac{\sum X}{N}$$

\bar{X} - Arithmetic Mean

$\sum X$ - Sum of the values of variables

N - Number of observation

ii) Standard Deviation

The standard deviation was calculated for the results obtained in the study. The results were computed using the formula.

$$\text{S.D} = \sqrt{\frac{\sum (X - \bar{X})^2}{N}}$$

RESULTS

Blood is a sensitive indicator of health. In the present investigation, age-related changes in the haematological parameters were presented in the form of tables and figures. Considerable variation was found in the parameters of different age groups.

Table 1 and Figure 1 show the population size of school students. 150 school students were selected for the study, aged 11, 12, 13, 14, 15, 16, and 17. The highest number of girls belonged to the age of 16 (33 individuals).

Table 2 and Figure 2 show the value of haemoglobin in normal and anaemic girls.

Table 3 and Figure 3 show the value of packed cell volume in normal and anaemic girls.

Table 4 and Figure 4 show the value of erythrocyte count in normal and anaemic girls.

The haemoglobin levels in both normal and anaemic girls in the age group of 11, 12, 13, 14, 15, 16, and 17 were (10.51, 10.27, 10.23, 10.47, 10.23, 10.43, 10.4) and (9.23, 9.44, 9.05, 9.18, 9.45, 8.70, 9), respectively.

The packed cell volume in both normal and anaemic girls in the age group of 11, 12, 13, 14, 15, 16, and 17 were (31.53, 30.82, 30.7, 31.41, 30.7, 30.9, 31.46) and (27.51, 25.36, 27.15, 27.55, 28.35, 25.61, 25.36), respectively.

The value of erythrocyte counts in normal and anaemic girls aged 11, 12, 13, 14, 15, 16, and 17 were (3.24, 3.28, 3.35, 3.43, 3.27, 3.24, 3.41) and (2.81, 2.81, 2.33, 2.65, 2.73, 2.63, 2.65), respectively.

The mean value of MCV in both normal and anaemic girls in the age group of 11, 12, 13, 14, 15, 16, and 17 were (88.5, 87.8, 87.4, 87.68, 88.12, 97, 89) and (75.75, 76, 75.4, 74.46, 74.5, 74.58, 74.12), respectively.

The mean value of MCH in both normal and anaemic girls in the age group of 11, 12, 13, 14, 15, 16, and 17 were (30.4, 30.3, 30.2, 30.4, 30.3) and (23.5, 29.28, 25, 30.5, 25, 25.38, 25.22), respectively.

The mean value of MCHC in both normal and anaemic girls in the age group of 11, 12, 13, 14, 15, 16, and 17 were (34.46, 33.66, 33.8, 34, 33.25, 33.7, 30.83) and (30.27, 30.14, 29.6, 29.4, 29.75, 29.84, 29.69), respectively.

TABLE – 1 POPULATION SIZE IN GIRLS

Age (In years)	Population Size (In Numbers)
11	26
12	13
13	10
14	29
15	16
16	33
17	23

TABLE-2 HAEMOGLOBIN (HB) LEVELS IN GIRLS

Age (In years)	Mean	
	Girls	
	NORMAL	ANAEMIC
11	10.512 ± 0.761	9.23 ± 0.173
12	10.275 ± 0.685	9.44 ± 0.282

13	10.233 ± 0.447	9.05 ± 0.848
14	10.472 ± 1.489	9.18 ± 0.519
15	10.233 ± 0.447	9.45 ± 1.732
16	10.433 ± 0.447	8.70 ± 1.688
17	10.4 ± 0.204	9.00 ± 0.360

TABLE-3 PACKD CELL VOLUME (PCV) LEVELS IN GIRLS

Age (In years)	Mean	
	Girls	
	Normal	Anaemic
11	31.53 ± 0.761	27.51 ± 0.173
12	30.82 ± 0.685	25.36 ± 0.282
13	30.7 ± 0.447	27.15 ± 0.848
14	31.41 ± 1.489	27.55 ± 0.519
15	30.7 ± 0.447	28.35 ± 0.173
16	30.9 ± 0.447	25.61 ± 1.688
17	31.46 ± 0.204	25.36 ± 0.360

TABLE – 4 TC : RBC LEVELS IN GIRLS

Age (In years)	Mean	
	Girls	
	Normal	Anaemic
11	3.240 ± 0.608	2.816 ± 0.337
12	3.282 ± 0.5	2.816 ± 0.5
13	3.355 ± 0.685	2.33 ± 0.9
14	3.438 ± 0.984	26.5 ± 0.5
15	3.278 ± 1.236	2.73 ± 0.5

16	3.242 ± 1.708	2.633 ± 1.857
17	3.413 ± 0.4	2.653 ± 1.013

TABLE-5 MEAN CORPUSCULAR VOLUME (MCV) LEVELS IN GIRLS

Age (In years)	Mean	
	Girls	
	Normal	Anaemic
11	88.5 ± 0.141	75.75 ± 0.4
12	87.8 ± 0.374	76.00 ± 0.608
13	87.4 ± 0.806	75.4 ± 0.479
14	87.68 ± 0.360	74.46 ± 0.519
15	88.12 ± 0.479	74.5 ± 0.1
16	97.00 ± 0.894	74.58 ± 0.4
17	89.00 ± 0.244	74.12 ± 0.1

TABLE – 6 MEAN CORPUSCULAR HAEMOGLOBIN (MCH) LEVELS IN GIRLS

Age (In years)	Mean	
	Girls	
	Normal	Anaemic
11	29.33 ± 0.538	23.5 ± 2.323
12	24.16 ± 0.616	29.28 ± 0.331
13	30 ± 0.824	25 ± 0.458
14	25.09 ± 0.538	30.5 ± 0.3
15	30.5 ± 0.509	25 ± 2.323
16	29.9 ± 0.748	25.38 ± 0.565
17	29.85 ± 0.1	25.22 ± 1.749

TABLE – 7 MEAN CORPUSCULAR HAEMOGLOBIN CONCENTRATION (MCHC) LEVELS IN GIRLS

Age (In years)	Mean	
	Girls	
	Normal	Anaemic
11	34.46 ± 0.6	30.272 ± 0.1
12	33.66 ± 0.6	30.142 ± 0.346
13	33.8 ± 0.714	29.6 ± 0.591
14	34 ± 0.282	29.4 ± 0.591
15	33.25 ± 0.374	29.75 ± 0.223
16	33.7 ± 0.959	29.846 ± 0.346
17	30.83 ± 2.049	29.69 ± 0.1

The present study clearly confirms that a significant proportion of apparently healthy children suffer from anaemia. This may be due to the current trend of consuming unhealthy and junk foods, which do not supply the necessary nutritional requirements for growing children, leading to anaemia in healthy children. The higher prevalence of anaemia in adolescents could be due to the hormonal changes that occur at the onset of menarche. The prevalence of anaemia is disproportionately high in developing countries due to poverty, inadequate diet, certain diseases, pregnancy/lactation, and poor access to health services. Importance should be given, and steps should be taken to combat these deficiencies in adolescent girls to compensate for the additional iron requirements, which are essential for growth and development during puberty. The prevalence of various parasitic infestations and other chronic illnesses was not included in this survey.

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ACADEMIC EXPLORATION AND BRAND ISSUES

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ABSTRACT

Academic exploration is related to erudite work and due to lots of analogous exploration works the chances of getting immorally copied raises. So, to cover from being unauthorized dupe of work Intellectual Property law gives protection by Copyright Act. For that it provides many essential criteria which need to be fulfilled. The guidelines are generally veritably common in all Countries. So, generally any exploration work which is done get defended fluently in all countries. But if any person doesn't follow that guideline, also he or she shall not be defended by Brand in lieu of guarding they get punished. Copyright Act cover author by proscribing others to copy work without authorization.

KEY WORDS: Academic exploration, Brand Issue and Author Rights.

INTRODUCTION

Preface Brand may be a right that grants the tradesman of distinctive work exclusive rights for its use and allocation. This is frequently generally just for a defined time. The exclusive rights do not feel to be absolute still confined by limitations and exceptions to brand law, as well as simply use. A main limitation on brand is that it protects solely the distinctive expression of ideas, and not the underpinning ideas themselves. The main object of intellectual property law is to convert the creation of a great variety of intellectual inventories. To achieve this, the law gives people and businesses property rights to the information and intellectual goods they make, generally for a limited period of time. Because they can earn profit from them, this gives profitable enticement for their creation. These profitable impulses are anticipated to stimulate invention and put in to the specialized progress of countries, which depends on the quantum of protection granted to originators.

ACADEMIC RESEARCH

Academic Research refers to conservative study of a specified content, field, or extremity, accepted to find out data or principles. When there's academic exploration the brand issue arises. When we search for any erudite work like papers we find that some of

them are copyrighted while others are not. An author may or may not brand his workshop. A work which isn't copyrighted can be used by world for its benefit while some authors put restriction on the world for using their workshop for its benefit by copyrighting his work.

RIGHT BRAND

It is a legal term used to describe the rights that generators have over their erudite and cultural workshop. Works covered by brand range from books, music, oils, form and flicks, to computer programs, databases, announcements, charts and specialized delineations. The total term of protection for erudite work is the author's life plus 60 times. For cinematographic flicks, photos, records, postmortem publications, anonymous publications, pseudonymous publications, workshop of government and transnational agencies, the term is 60 times from the morning of the timetable time following the time in which the work was published.

For broadcasting, the term is 25 times from the morning of the timetable time following the time in which the broadcast was made. Brand is a legal term used to describe the rights that generators have over their erudite and cultural workshop. Works covered by brand range from books, music, oils, form, and flicks, to computer programs, databases, announcements, charts, and specialized delineations. There's protection handed to original intellectual work in erudite, trades of the scientific area, whatever its description, form of expression, significance or purpose under the Brand law in the UAE. The ministry of frugality in the UAE allows brand enrollment, and after its blessing, the brand remains valid for the entire continuance of the proprietor and times following the death.

BRAND ACT

The Copyright Act, 1957 protects original erudite, dramatic, musical and cultural workshop and cinematograph flicks and sound recordings from unauthorized uses. Unlike the case with patents, brand protects the expressions and not the ideas. Brand refers to the legal right of the proprietor of intellectual property. In simpler terms, brand is the right to copy. This means that the original generators of products and anyone they give authorization to are the only boneswith the exclusive right to reproduce the work. Brand law gives generators of original material the exclusive right to further use and duplicate that material for a given quantum of time, at which point the copyrighted item becomes public sphere.

ESSENTIALS FOR EDUCATIONAL BRAND

A brand name for educational institutions is defined by intangible factors like the quality of the education it imparts, its faculty, culture and resources available for students. For education institutes, the product is the education and the prospective customer is the student and generally the consumer cannot enjoy two competing products at the same time. An educational institute, to be reputed, must concentrate on the following very basic issues:

1. Curriculum and Teaching Pedagogy
2. Technology Enabled Learning
3. Well Qualified Faculty.

MEASURES ADOPTED TO BUILD BRAND

Branding an educational institution is very much needed these days of cut throat competition and a good brand name can really benefit an educational institute greatly. It is very easy for an educational institution having great brand image, to attracting best faculty worldwide, meritorious students and hard working staff.

HISTORY OF COPYRIGHT LAW IN INDIA

Copyright law in India was introduced during the rule of the Britishers in India. The Act legislated under the reign of Britishers was the British Copyright Act, 1911. The British Copyright Act, 1911, had completely different vittles as compared to the current Brand Law. At the earlier time of the British period, the duration of the brand was for the continuance of the author or creator plus 7 times after the death of the author or creator. Though, the total duration of Brand protection of a work can not exceed the time period of 42 times.

TYPES OF WORKS DEFENDED IN COPYRIGHT IN INDIA

The Literary Works includes the original or unique creation of literature, which can be in any form like a work of fabrication, specialized books or paper, memoir, dramatics, thesis, script, exploration work, compendium, tables, and computer programmes including computer databases. It can be claimed anyhow of the style, quality, or erudite merit of the work.

DRAMATIC WORKS

The Dramatic Work is also a type of erudite work. The Dramatic Works includes any arrangement of acting a play, or a part for enumeration, or calculating work or dumb show entertainment, a graphic arrangement, or acting work grounded on a fixed jotting work. But, the Dramatic workshop doesn't include any type of cinematograph flicks.

MUSICAL WORKS

A Musical Work is a distinct work that's copyrightable in itself. The Musical Works doesn't include any sound or lyrics. Though the workshop related to sound recordings are dependent on the musical workshop, but for the protection of Musical Works, a separate operation is needed to be moved with the Copyright Office for the Registration of similar musical work. The author of a sound recording isn't needed to take any authorization from the author of a Musical Work.

For enjoying Brand protection for a Musical Works, it isn't needed that the Musical Work is written down. Cultural WORKS Section 2 of the Copyright Act, 1957 provides for the vittles related to the Cultural workshop defended by Brand in India. Under Section 2 of the Copyright Act, 1957, a protection of brand in artwork exists in an original cultural work comprising of puppets, oils, cartoons, plates, lithographs, showpieces, delineations, plans, photography, plates, models of structures, maps, structures, charts, molds and casts for puppets.

CINEMATOGRAPH

A cinematograph film is a work of visual recording together with the sound recordings fulfilled by any process, whether digital or similar, including the videotape flicks. It also includes visual recording in any medium and by any way of storing similar visual recording. As per the description of cinematograph flicks, every single recorded work with moving images or illustrations will be considered a cinematograph.

SOUND RECORDINGS

A Sound Recording comprises of any work of sound recording irrespective of its storehouse medium. The songs which contain vocalizers voice with or without music, a recorded speech or an audio, or podcast is the exemplifications of sound recording. In case the sound recording also contains music, so the authorization from the author of musical work is needed to be attained for the Brand protection of the sound recording.

BRAND IN EDUCATION

The use of accoutrements confined by brand is important to the literacy procedure. Educational coffers live in all formats that are predictable as ' works ' in brand law. To reduce the cargo on preceptors and scholars who want to make use of brand accoutrements as part of their tutoring and literacy experience, the law includes a number of exceptions that

permit for the use of all types of brand work for certain educational purposes. If you're using accoutrements in an educational perspective this doesn't mean that you can forget about brand. What it does mean is that one needs to be conscious of when one can use a work without carrying concurrence or paying a license figure, and when concurrence or a license is needful. For case, if a academy or council wishes to record TV broadcasts for use within a classroom, it should get a license from the Educational Recording Agency. Within any educational institution there's generally someone who's responsible for brand issues. 1. Public sphere 2. Licensing and Brand.

CONCLUSION

The different categories in which the works can be potentially protected by copyright are so broad that it is challenging to imagine the other type of works that cannot be protected by copyright.

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AWARENESS ABOUT HUMAN RESOURCES MANAGEMENT IN THE DIGITAL AGE

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ABSTRACT:

In the digital age, Human Resources Management (HRM) has undergone transformative changes, driven by technological advancements and evolving workforce dynamics. This paper explores the impact of digital technologies, such as artificial intelligence, big data, and cloud computing, on HRM practices. The integration of these technologies has revolutionized recruitment, performance management, employee engagement, and learning and development. Additionally, the paper examines the challenges posed by the digital transformation, including data privacy concerns, the need for upskilling HR professionals, and the changing nature of work. Through a comprehensive review of current practices and emerging trends, this paper provides insights into how organizations can effectively manage their human resources in an increasingly digital world, fostering innovation, agility, and a competitive edge.

Keywords - *Digitalisation, HR Annalistic, Competencies, Tertiary education.*

Introduction:

The rapid advancement of digital technologies has fundamentally altered the landscape of business operations, including the management of human resources. As organizations navigate the complexities of the digital age, the role of Human Resources Management (HRM) has evolved from traditional administrative functions to becoming a strategic partner in driving innovation and organizational success. The digital transformation has introduced a range of tools and platforms that have reshaped how HR functions are conducted, from talent acquisition and onboarding to performance management and employee engagement.

The rise of technologies such as artificial intelligence (AI), big data analytics, cloud computing, and social media has enabled HR professionals to make data-driven decisions, streamline processes, and enhance the employee experience. However, this transformation

also brings new challenges, including issues related to data privacy, cybersecurity, and the need for continuous upskilling. Moreover, the shift towards remote and hybrid work environments has necessitated a reevaluation of traditional HR practices to ensure they remain relevant and effective in this new era.

This paper explores the implications of the digital age on HRM, examining both the opportunities and challenges it presents. By understanding the impact of digital technologies on HR practices, organizations can better position themselves to attract, retain, and develop talent in an increasingly competitive and fast-paced environment.

The future of work : remote working and gig economy

The future of work is increasingly defined by the rise of remote working and the gig economy. Remote work has become mainstream, offering flexibility and access to global talent while challenging traditional office-centric models. Simultaneously, the gig economy has grown, with more workers opting for freelance and contract-based roles, valuing autonomy and diverse opportunities. These trends are reshaping employment, requiring organizations to adapt their management practices to accommodate a more decentralized and flexible workforce, while also addressing challenges such as job security, benefits, and worker engagement.

Remote working and the gig economy are transforming the future of work. Remote work offers flexibility and access to global talent, while the gig economy allows workers to take on freelance or contract roles. These shifts demand that organizations adapt to new ways of managing and supporting a decentralized workforce, focusing on flexibility, security, and worker engagement.

Talent Acquisition

1. **Data-Driven Recruitment:** Companies now leverage big data and AI to streamline the hiring process. This includes automated resume screening, predictive analytics to identify potential top performers, and AI-driven interviews, ensuring that the best candidates are selected efficiently.
2. **Employer Branding:** In an era where top talent has many options, building a strong employer brand is crucial. Tech-driven platforms allow companies to showcase their culture, values, and employee experiences through social media, websites, and digital campaigns, making them more attractive to potential hires.

3. **Diverse Talent Pools:** Technology has made it easier to reach diverse candidates globally. Remote working tools and online job platforms enable companies to tap into a global talent pool, enhancing innovation and creativity through diversity.
4. **Candidate Experience:** The hiring process itself is becoming a key factor in attracting talent. Companies are using tech to ensure a smooth and engaging candidate experience, from mobile-friendly application processes to virtual reality office tours.

Talent Retention

1. **Continuous Learning and Development:** In the tech-driven era, employees expect continuous learning opportunities. Companies are leveraging online learning platforms, AI-driven personalized learning paths, and virtual reality training to ensure their workforce stays updated with the latest skills.
2. **Employee Engagement Tools:** To retain talent, companies are using digital platforms to monitor employee engagement in real time. These tools help in understanding employee sentiment, identifying issues early, and providing solutions like mental health support, flexible work options, and career progression paths.
3. **Workplace Flexibility:** The rise of remote work and hybrid models, powered by collaboration tools, has made workplace flexibility a key retention strategy. Employees value the ability to work from anywhere, and companies that offer this flexibility tend to retain top talent longer.
4. **Performance Management:** Traditional annual reviews are being replaced by continuous feedback systems enabled by technology. These systems provide real-time insights into employee performance, helping to set clear goals, recognize achievements, and address issues promptly.

In summary, the tech-driven era 6.0 is characterized by a strategic blend of technology, data, and human-centric approaches in both talent acquisition and retention. Companies that effectively harness these tools are better positioned to attract and retain top talent in a highly competitive market.

AI in HR Processes

1. **Recruitment and Selection:**
 - **Automated Resume Screening:** AI-driven tools can quickly analyse vast numbers of resumes, identifying candidates that match job descriptions based

on skills, experience, and other criteria. This reduces time-to-hire and improves the accuracy of candidate selection.

- **Predictive Analytics:** AI models can predict which candidates are most likely to succeed in a role by analysing historical data on successful hires. These models consider factors such as past job performance, cultural fit, and career progression.

2. **Candidate Engagement:**

- **Chatbots:** AI-powered chatbots provide 24/7 communication with candidates, answering their questions, guiding them through the application process, and even scheduling interviews. This enhances the candidate experience and frees up HR teams from repetitive tasks.
- **AI-Driven Interviews:** Video interview platforms equipped with AI can analyze facial expressions, tone of voice, and word choice to assess a candidate's suitability for a role. These tools offer additional insights that complement traditional interviews.

3. **Employee Onboarding:**

- **Automated Onboarding Programs:** AI can create personalized onboarding experiences for new hires, tailoring training materials, schedules, and introductions to specific roles and individual learning styles. This accelerates the integration of new employees into the organization.
- **Virtual Assistants:** AI-driven virtual assistants help new employees navigate their first few weeks by answering questions, setting up meetings, and providing access to resources, all without the need for human intervention.

Automation in HR Processes

1. **Payroll and Benefits Administration:**

- **Automated Payroll Systems:** These systems ensure accurate and timely salary payments, tax calculations, and compliance with labour laws. Automation reduces human error and frees HR professionals from time-consuming administrative tasks.
- **Benefits Management:** Automation tools allow employees to enroll in, update, and manage their benefits packages through self-service portals. This simplifies the process for both HR teams and employees.

2. Performance Management:

- **Continuous Feedback Systems:** Automation enables real-time feedback mechanisms, where employees receive ongoing performance evaluations. These systems often integrate with AI to provide insights into areas of improvement and highlight strengths, leading to more effective performance management.
- **Automated Goal Setting and Tracking:** Tools can automatically track progress toward goals, providing updates and reminders to employees and managers. This ensures alignment with organizational objectives and enhances accountability.

3. Employee Engagement and Retention:

- **Sentiment Analysis:** AI-driven tools analyse employee communications, such as emails and surveys, to gauge overall sentiment and identify potential issues early. This allows HR to proactively address concerns and improve employee satisfaction.
- **Retention Prediction Models:** AI can predict which employees are at risk of leaving by analysing factors like engagement levels, performance data, and job market trends. HR teams can then take targeted actions to retain these employees.

4. Learning and Development:

- **Personalized Learning Paths:** AI analyses employee skills and career goals to create customized learning paths. These paths ensure that employees receive the training they need to advance in their careers and contribute more effectively to the organization.
- **Automated Compliance Training:** Automation ensures that all employees complete mandatory compliance training by tracking progress and sending reminders. This reduces the administrative burden on HR and ensures regulatory compliance.

S.no		Statistical analysis
1	HR Technology Adoption	60% of HR professionals say they are actively investing in HR technology to streamline their operations.

		40% of HR leaders agree that digital transformation is crucial for improving their HR processes.
2	Recruitment & Talent Acquisition	65% of employers use social media to attract talent, and 20% use AI-powered tools for screening resumes. 35% of HR teams use applicant tracking systems (ATS) to manage recruitment, improving efficiency by automating resume parsing and matching candidates with job descriptions.
3	Employee Engagement & Well-being	60% of organizations now use digital platforms to track employee engagement in real-time, utilizing tools such as pulse surveys or feedback apps. 40% of organizations are investing in wellbeing technology (e.g., mental health apps, fitness programs), with studies showing that engaged employees are 17% more productive.
4	Performance Management	45% of HR professionals report using digital tools for continuous performance feedback rather than relying on annual performance reviews. 55% of employees prefer receiving feedback via digital platforms (e.g., Slack, Teams) over traditional face-to-face meetings.
5	Future Trends in HRM	<p>Artificial Intelligence (AI): By 2025, the AI market in HR is expected to grow to \$3.2 billion, with a primary focus on automating administrative tasks, improving decision-making, and providing personalized learning experiences.</p> <p>Data-Driven HR: HR departments are increasingly relying on data analytics for decision-making. 65% of HR leaders use data to improve recruitment and performance management, while 35% of companies say data analytics is a high priority for HR in the coming years.</p> <p>Remote Work and Digital Communication: With</p>

		the rise of remote work, 70% of HR professionals say they are using digital tools like Zoom and Microsoft Teams to stay connected with employees, and 30% have introduced flexible working policies.
6	Benefits of Digital Transformation in HRM	<p>Efficiency: 40% of HR professionals say digital tools have significantly reduced time spent on administrative tasks, freeing them up for strategic initiatives.</p> <p>Cost Savings: Companies report 30% cost savings in HR processes (e.g., recruitment, onboarding, and performance management) due to automation and AI.</p> <p>Improved Decision-Making: 30% of HR leaders state that digital tools and analytics have helped them make more informed, data-driven decisions.</p>
7	Benefits of Digital Transformation in HRM	<p>Resistance to Change: 35% of HR professionals report that resistance to change is one of the biggest challenges when implementing new HR technologies.</p> <p>Data Security: With the rise of digital tools, 40% of HR professionals are concerned about data security and privacy, especially regarding employee personal data.</p> <p>Skill Gaps: 25% of HR professionals agree that there is a skill gap in handling advanced digital HR tools, requiring ongoing training and development.</p>

Conclusion

Human Resource Management in the digital age is characterized by the integration of technology, data-driven decision-making, and a focus on employee-centric approaches. This transformation has enabled HR to become more strategic, efficient, and responsive to the needs of both the organization and its employees. By leveraging digital tools, HR can foster a more engaged, skilled, and adaptable workforce, ultimately driving organizational success in an increasingly competitive and dynamic environment.

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