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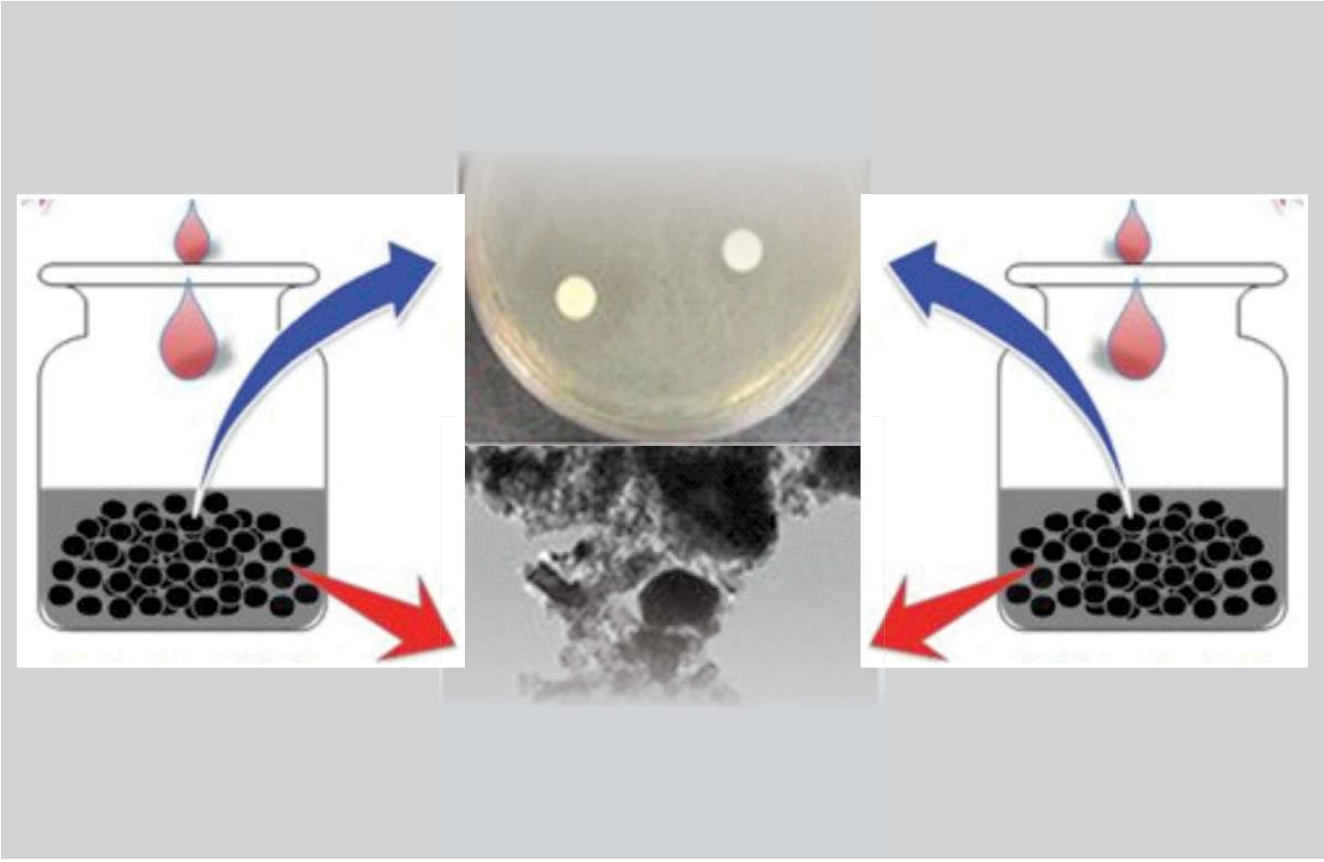

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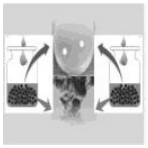

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Synthesis, Characterization, Photocatalytic and Antimicrobial Activities of Copper Doped Silver and Nickel Oxide Nanoparticles

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ABSTRACT: *The copper-doped silver and nickel oxide nanoparticles were prepared by the co-precipitation method in which the silver oxide (Ag_2O) and nickel oxide (NiO) nanoparticles are doped with copper in 4:1 in the presence of sodium dodecyl sulfate (SDS), a surfactant. Then various analytical studies were carried out by using X-ray diffraction (XRD) and Diffuse reflectance spectroscopy (DRS). The XRD analysis revealed the crystalline structure and the size of nanoparticles was determined by using Scherrer's formula. The XRD data showed the effect of doping on crystallinity and size. It was found that the size of nanoparticles was reduced without any change in crystallinity after doping. DRS results showed that when silver oxide and nickel oxide nanoparticles were doped with copper oxide nanoparticles, the energy band gap was shifted to a lesser value, i.e., from 1.50 to 1.17 eV for Ag_2O and from 2.29 to 2.08 eV for NiO, respectively. The photocatalytic degradation of methylene blue (MB) and eriochrome black-T (EBT) by nanoparticles was monitored by UV-Vis spectroscopy. The antimicrobial activity of the synthesized nanoparticles was checked by using well diffusion assay and it was found that doped nanoparticles were more active than the undoped ones.*

Keywords: *Nanoparticles, Doping, XRD, DRS, Antimicrobial activities, Photocatalytic degradation, co-precipitation method*

INTRODUCTION

Different terminologies have been used for "nanoparticle" by various regulatory bodies both nationally and internationally. Nanoparticles (Nps) are those which have at least one dimension in 1-100 nm range (Miernicki et al., 2019). Nps are not new in nature or science. Several characterization techniques were developed to understand the phenomena and properties of matter on reducing their size from bulk to nanoscale. Many of the biological processes occurring at the nanoscale have revolutionary effects and the researchers are able to use the particles at the nanoscale and to enhance their work in different fields such as imaging, printing, catalysis, material science, computing and in medicine (Dhand et al., 2016). Nanotechnology is concerned with the dimensions of Nps. Nanotechnologist also uses the physical, chemical, biological and optical features that occur naturally at the nanoscale. There is a dramatic change in properties of matter at nanoscale in comparison with the bulk. At the nanoscale, the quantum effect deals with the behaviour and characteristics features of matter (Zhang et al., 2010). Different metals and metal oxide based Nps have been used as catalysts, absorption, sensors, antimicrobial and reducing agents due to their unique properties (Nair et al., 2011). They have high surface to volume ratio so that they have very fast reaction kinetics and increased sorption ability. There are some drawbacks of NPs regarding their applications in real life e. g. high pressure drop in flow through system; they don't have specificity for reaction in complex system. They also have weak mechanical strength (He et al., 2016).

The size of particles, surface characteristics, properties, degree of toxicity, biodegradability and biocompatibility depends on the method of preparation of Nps (Abdussalam-Mohammed, 2020).

Doping has revolutionized in the industry of semiconductors (Yang et al., 2020). There is always a challenge for the introduction of dopants into the pure Nps. For the enhancement of properties of doped Nps various kinds of interactions are feasible. These properties come from spin exchange interactions between substrate and dopant, stable isolated electronic state and from structural defects (Bharat et al., 2019).

In the present work, we synthesized the copper-doped silver oxide and nickel oxide Nps by using a simple method known as the co-precipitation method. The photocatalytic activity of the nanoparticles was elaborated by degradation of methylene blue (MB) and eriochrome black-T (EBT). The biological potential was investigated by screening Nps against various species bacteria and fungus.

MATERIALS AND METHOD

Materials

All the precursors like $AgNO_3$, $Cu(NO_3)_2$, $CuCl_2$, $NiCl_2.6H_2O$ and NaOH employed in the current study were

obtained from Sigma-Aldrich. Sodium dodecyl sulfate (SDS) and Organic dyes (MB and EBT) were purchased from Across Organics. Distilled water was obtained from the, research lab of UMT, Lahore. All these chemicals were obtained in the form of highest purity. The crystal structure of pure and doped Nps was studied by Bruker, D8/Germany X-ray diffractometer using Cu-Kα(1.5406 Å) emissions with K = 0.9. UV-Visible/NIR spectrometer (Perkin Elmer, Lambda 950/UK) was used to obtain absorbance, reflectance and transmittance up to 3300 nm.

Synthesis of metal oxide nanoparticles

A co-precipitation method is used to synthesize metal oxide nanoparticles which is very simple and easy. Firstly, 0.1 M solution of surfactant was prepared by dissolving 2.8 g of SDS in 100 mL of distilled water. The solution was continuously stirred for 20 minutes at a temperature of 60-70 ^{o}C. Then 2 g of metal salts ($AgNO_3$, $Cu(NO_3)_2$, $CuCl_2$, $NiCl_2.6H_2O$) was added separately to the above solution and the resultant mixture was sonicated for 30 minutes. Finally a 5 M solution of sodium hydroxide (NaOH) was added drop wise until a pH of 10-11 was attained. The mixture was stirred at room temperature for 3-5 hours until the precipitates of Ag_2O, CuO and NiO in nanoscale range were appeared, respectively. These nanoparticles were filtered and washed with distilled water for several times. The collected nanoparticles were dried at 85-100 °C for 3 hours. At the end the obtained nanoparticles were annealed at 500-600 ^{o}C for 30 minutes to remove the organic residue if any.

Synthesis of Doped Nanoparticles

For the preparation of doped Nps, $AgNO_3$ and $Cu(NO_3)_2$ and $CuCl_2$ & $NiCl_2.6H_2O$ were taken separately in 4:1 ratio in 100 mL of SDS solution. The obtained mixture was ultrasonicated at room temperature for dispersion for 1 hour. The fine Nps were formed in basic media, for this purpose 5M NaOH solution was added drop wise to adjust pH up to 11-12. The resulting suspension was stirred at room temperature for 30 minutes. The precipitates of doped nanoparticles were filtered and washed with distilled water repeatedly to remove excess base. After that, the resulting nanoparticles were air dried and then calcined at high temperature to remove organic residue at 500-600 ^{o}C for 30 minutes.

RESULTS AND DISCUSSION

Powder X-Ray Diffraction Studies

Fig. 1(a-d) showed the XRD spectra of pure CuO, Ag_2O and NiO Nps before and after doping. The results of XRD confirmed the crystallinity, size and purity of metal Nps and also give some information about the effect of doping on the shape and size of the Nps. It is clear from the XRD pattern that as the dopants such as copper are introduced in the silver

and nickel, the diffraction peaks get broadened and the particle size is further reduced. From peaks it is also revealed that when Cu ion is substituted into the metal oxide lattice. The overall structure of the NiO/Ag_2O Nps will remain the same as the Cu ions replaces Ni/Ag substitutionally in the lattice, instead of getting into the void spaces (Lanje et al., 2010).

Debye-Scherrer's formula was used to calculate the average crystallite size of pure CuO, NiO, Ag_2O and copper doped NiO/Ag_2O nanoparticles and presented in the Table 1. From data it was found that the doped metal oxide NPs seemed better in terms of precise crystallite size, than the undoped ones.

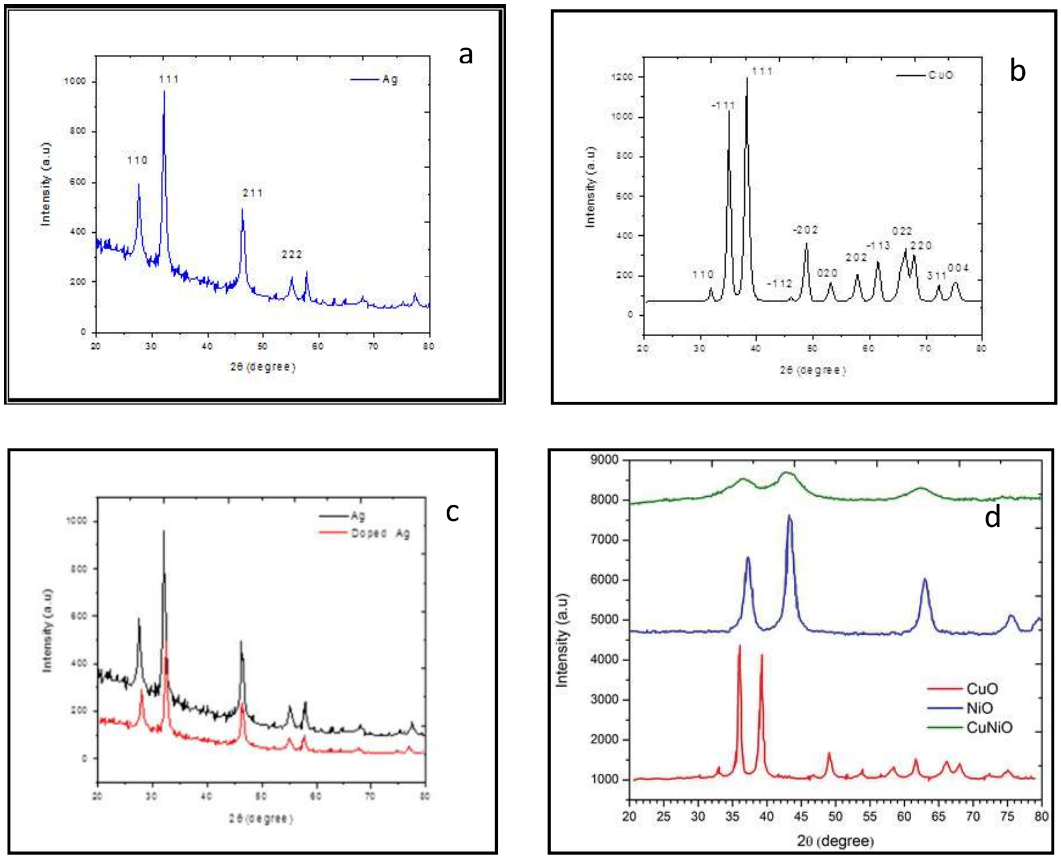


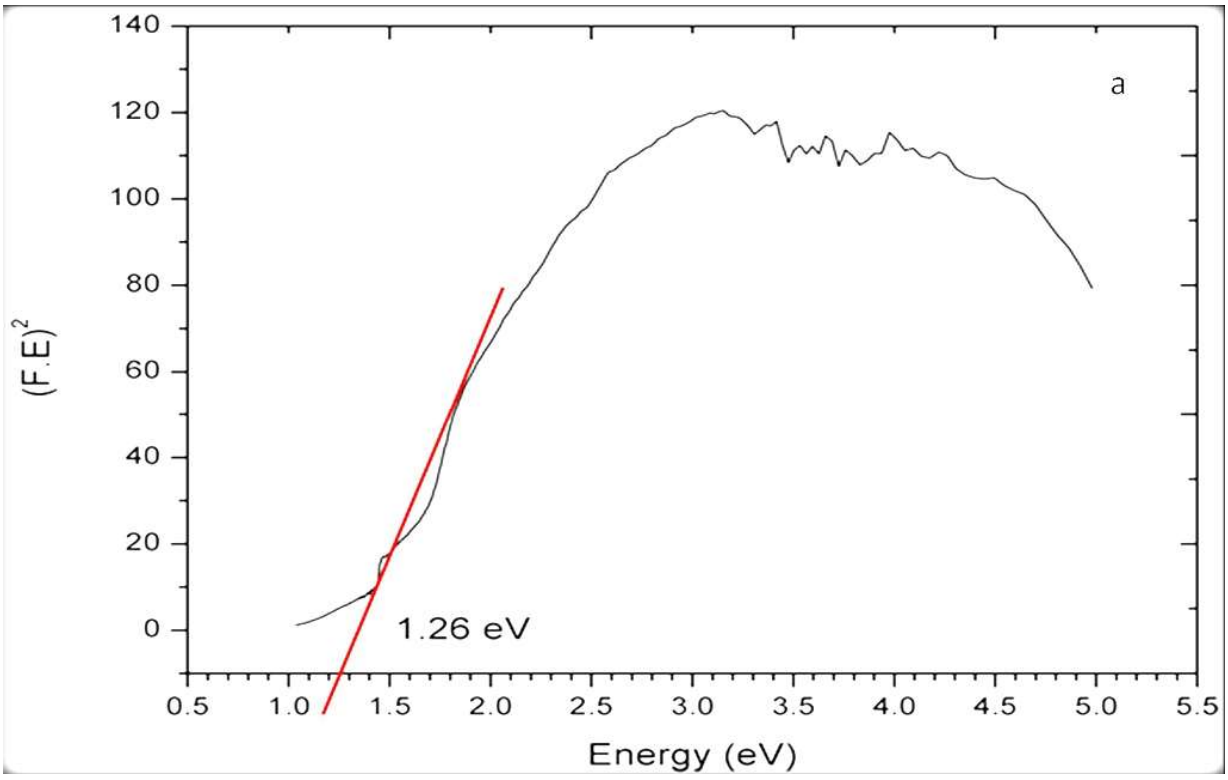
Fig. 1: Powder XRD spectra of a) Ag_2O nanoparticles (Top left) b) CuO nanoparticles (Top right) c) Cu doped Ag_2O nanoparticles (Bottom left) d) Combined spectra of CuO, NiO and Cu doped NiO nanoparticles (Bottom right)

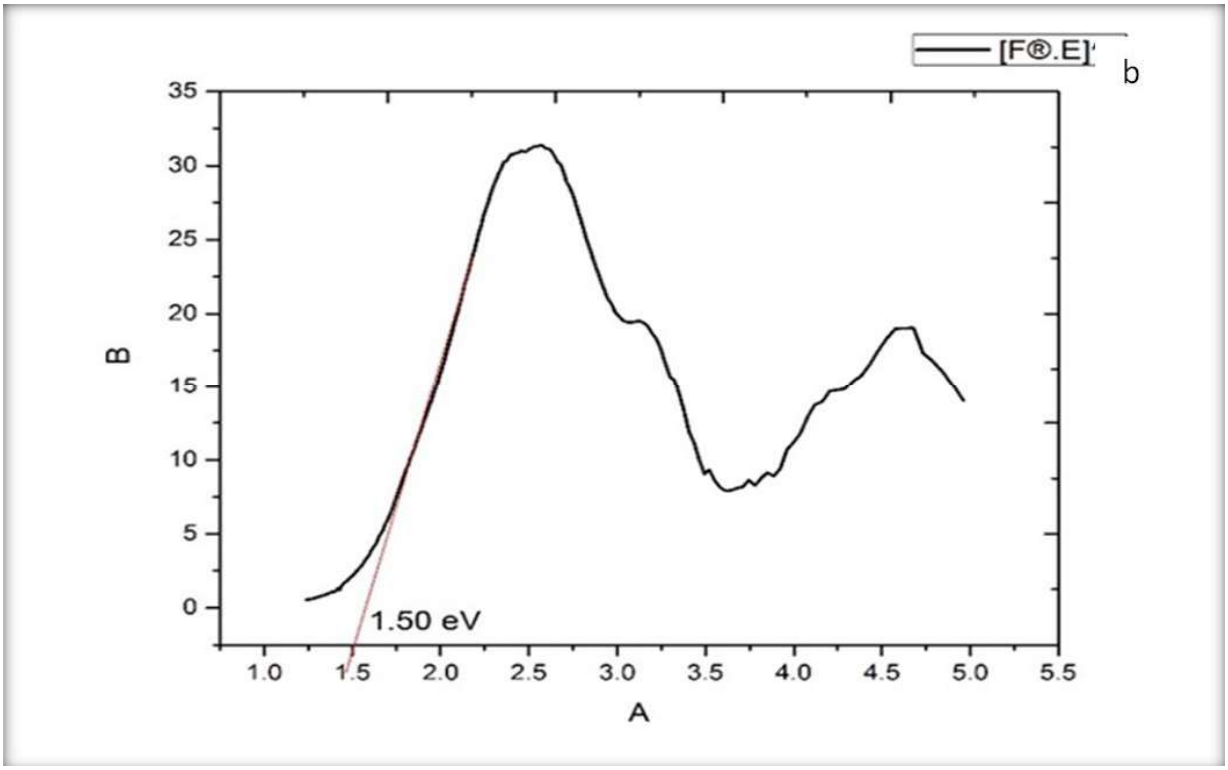
Table 1: Average particle size of the nanoparticles

Serial No	Nanoparticles	Particle size (nm)
1	CuO	11.3
2	NiO	9.1
3	Ag_2O	10.5
4	Cu doped NiO	2.4
5	Cu doped Ag_2O	5.6

Diffuse reflectance studies

DRS spectra (Fig. 2 (a-d)) showed that whenever Ag_2O/NiO nanoparticles were doped with CuO the band gap of pure metal nanoparticles was reduced. DRS spectra showed that the pure Ag_2O Nps have the band gap of 1.50 eV as demonstrated by tangent. On doping with CuO nanoparticles the band gap was decreased to 1.17 eV. Same is the case for NiO nanoparticles in which value of band gap was decreased from 2.29 to 2.08 eV on doping with CuO nanoparticles (Bashir et al., 2019).

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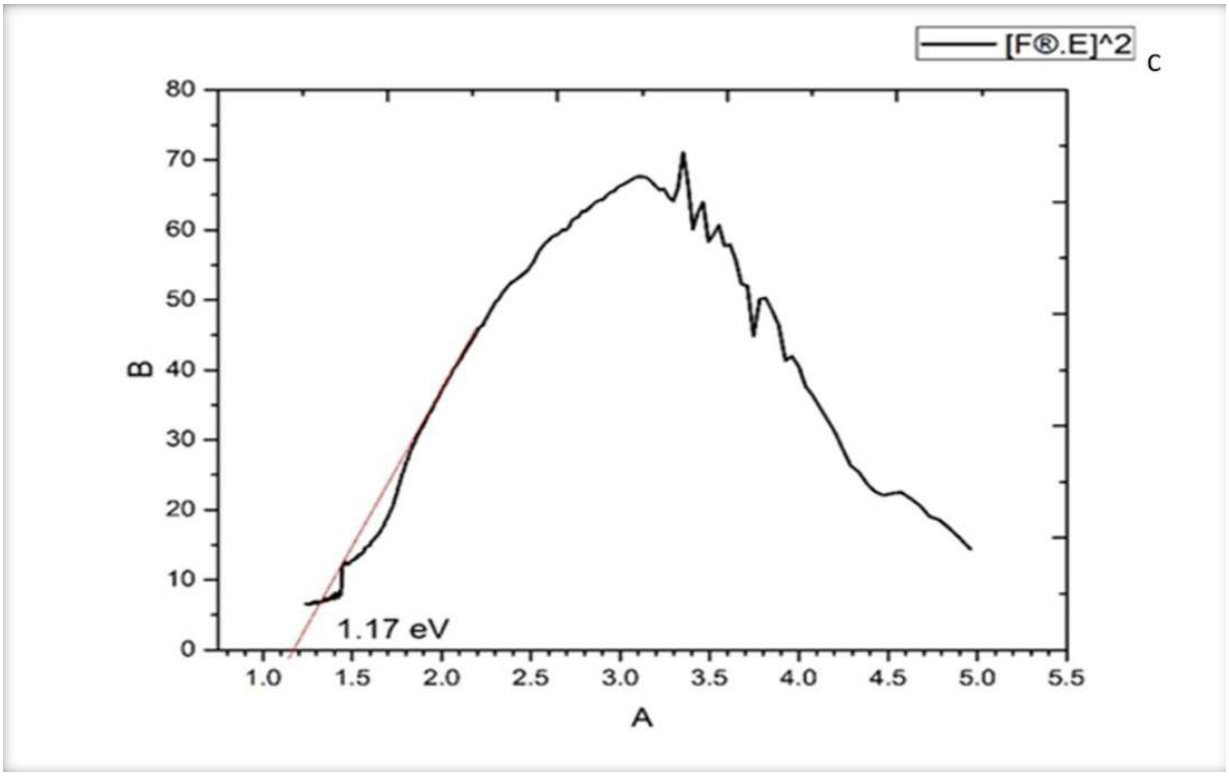
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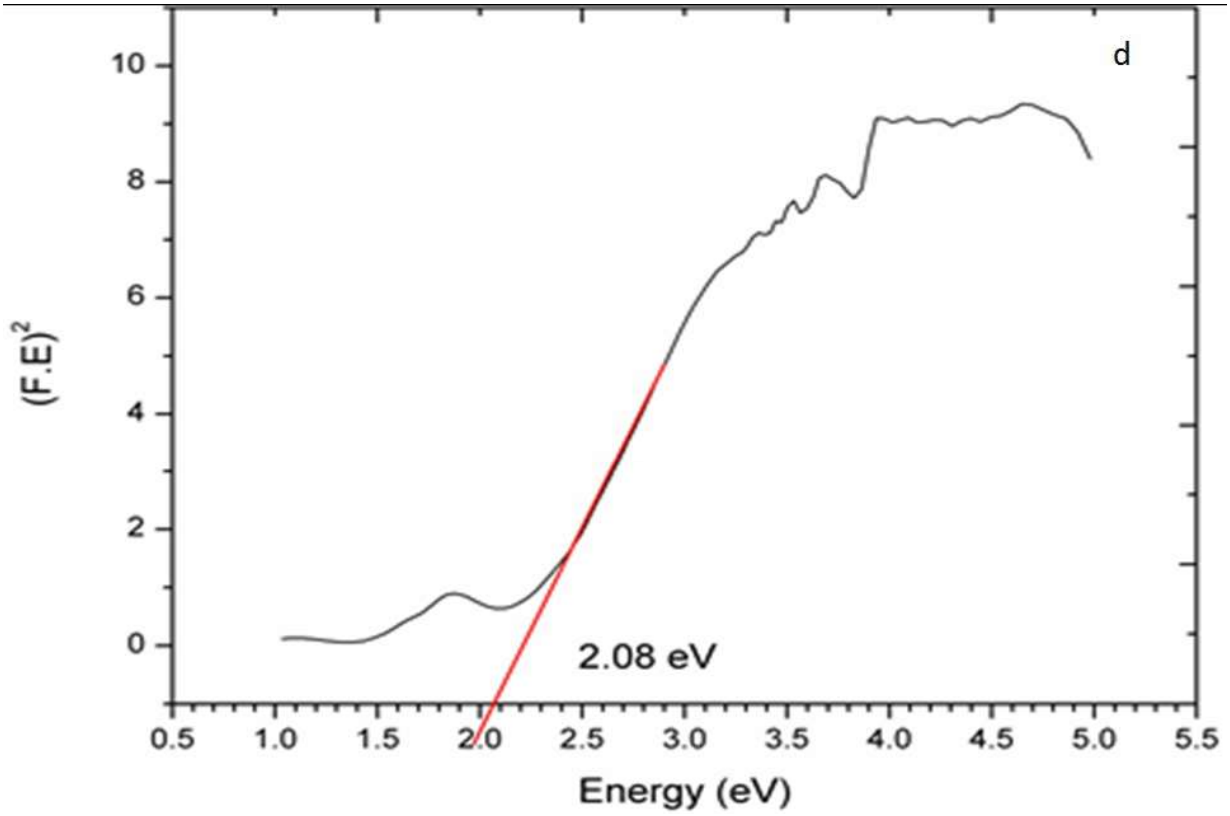

Fig. 2: DRS spectra of a) CuO nanoparticles b) Ag_2O nanoparticles c) Cu doped Ag_2O nanoparticles d) Cu doped NiO nanoparticles

Antimicrobial activity of nanoparticles

Well diffusion method is chosen to determine the antimicrobial activity of silver oxide (Ag_2O), copper oxide (CuO), nickel oxide (NiO), and copper doped Ag_2O/NiO Nps against Gram-positive bacteria including *Streptococcus mutans* and *Acinetobacter baumanii* and Gram-negative bacteria including *Pseudomonas aeruginosa, Escherichia coli,* and *Klebsiella pneumonia* and against a fungal specie *Candida albicans.*
For this purpose, microbes were revitalized on their respective media (Fig. 3).

(a) *Pseudomonas aeruginosa* was invigorate on nutrient media

(b) *Escherichia coli* on MacConkey's agar

(c) *Candida albicans* on chocolate agar

(d) *Streptococcus mutans* on TYCSB (tryptone yeast cysteine sucrose bacitracin) agar

(e) *Acinetobacter baumanii* on MacConkey's agar

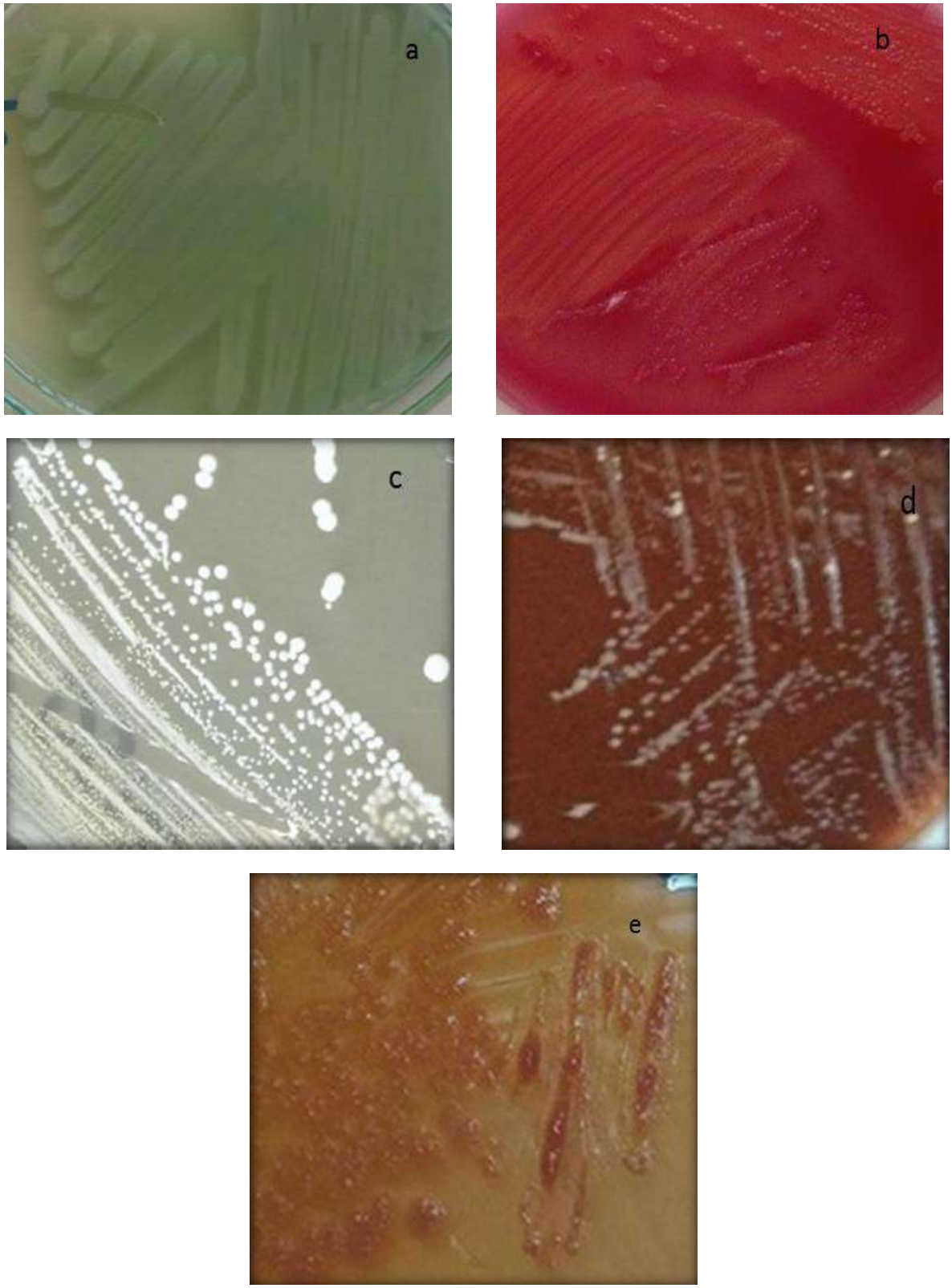

Fig. 3: Growth of microbes on different agar media: (a) nutrient agar media (b) MacConkey's agar (c) Chocolate agar (d) TYCSB agar (e) MacConkey's agar

Well diffusion assay

To evaluate the antimicrobial activity, a well diffusion assay was chosen due to its simplicity. Two concentrations of nanoparticles 200 µg/mL and 500 µg/mL were prepared for all samples. Nps were transferred into shafts and incubated at 37 ^{o}C for 24 hours to check the activity of microbes against nanoparticles (Kumar et al., 2017). The Fig. 4 (a-f) exhibited the zone of inhibition of prepared NPs against *Escherichia coli*, *Pseudomonas aeruginosa, Acinetobacter baumanii* and *Candida albicans.* Overall data of the antimicrobial potential shown by nanoparticles is summarized in Table 2 and in the form of histogram in Fig. 5.

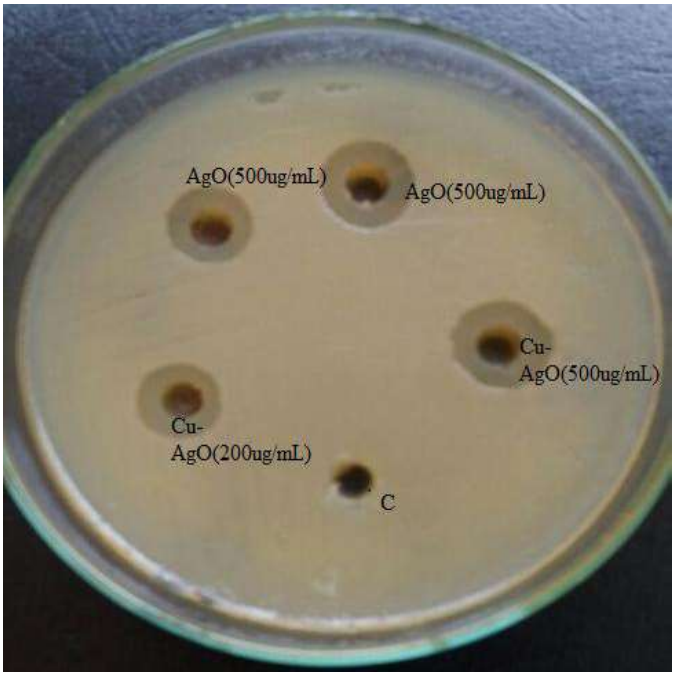

Fig. 4(a): Zone of inhibition of silver oxide, copper doped silver oxide NPs against *Escherichia coli*

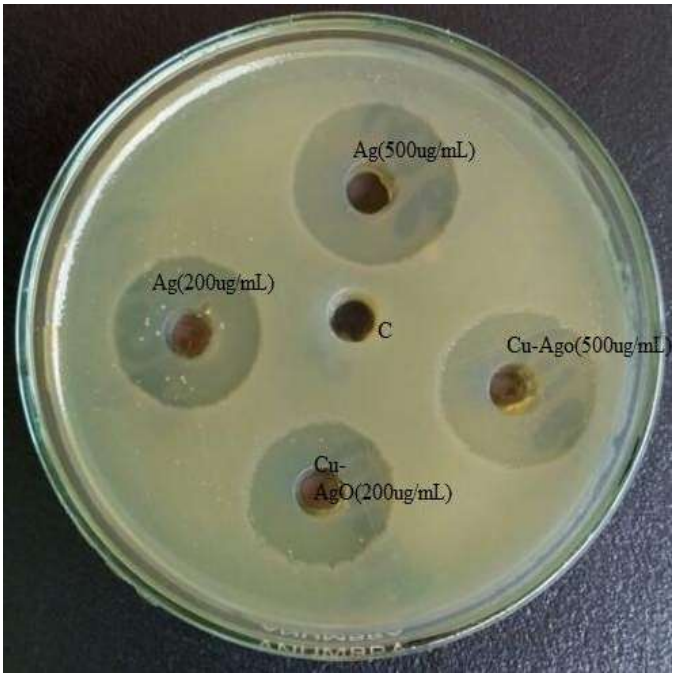

Fig. 4 (b): Zones of inhibition of silver oxide and copper doped silver oxide NPs against *Pseudomonas aeruginosa*

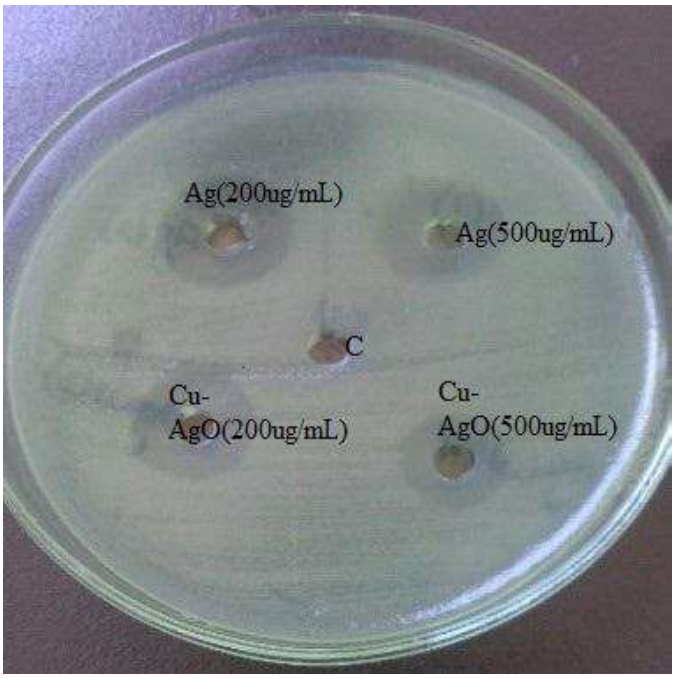

Fig. 4 (c): Zone of inhibition of silver oxide and copper doped silver oxide nanoparticles against *Pseudomonas aeruginosa*

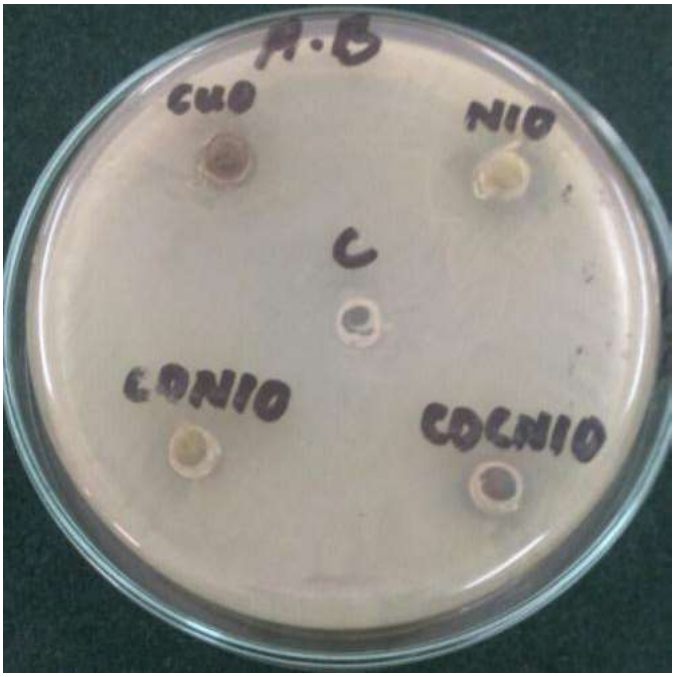

Fig. 4(d): Zone of inhibition of nickel oxide, copper oxide and copper doped nickel oxide NPs against *Pseudomonas aeruginosa*

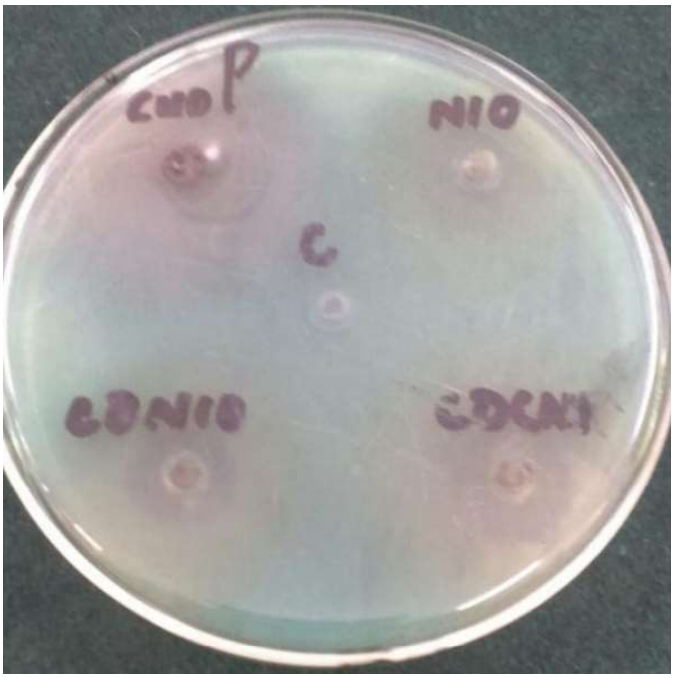

Fig. 4(e): Zone of inhibition of nickel oxide, copper oxide and copper doped nickel oxide NPs against *Acinetobacter baumanii*

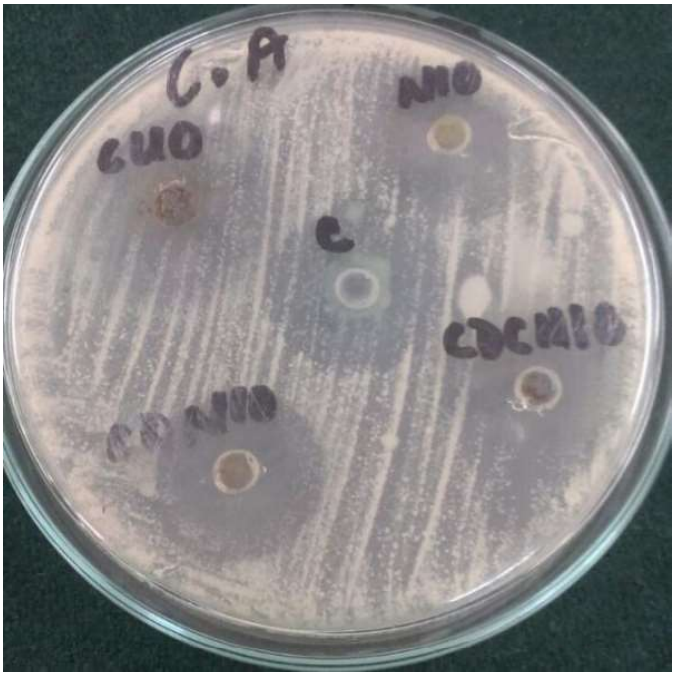

Fig. 4(f): Zone of inhibition of nickel oxide, copper oxide and copper doped nickel oxide NPs against Candida albicans

Table 2: Zone of inhibition (mm) of various microorganisms against copper oxide (CuO), silver oxide (Ag_2O), nickel oxide (NiO) and copper doped NiO/Ag_2O Nps with concentrations of 200 µg/mL and 500 µg/mL. (NZ= no zone of inhibition).

Indicator microbes	Type of microbe	Standard	Zone of inhibition (mm)	Antimicrobial activity of nanoparticles									
				CuO		Ag_2O		NiO		Cu-NiO		Cu-Ag_2O	
				Concentration (µg/mL)									
				200	500	200	500	200	500	200	500	200	500
				Zones of inhibitions (mm)									
K. pneumoniae	Gram – ve	Ampicillin	12	15	18	16	18	8	10	10	12	13	15
E. coli			19	10	15	15	17	10	12	14	16	15	18
P. aeruginosa			12	12	13	19	20	16	18	14	16	18	20
Acinetobacter	Gram + ve		14	5	8	14	16	12	14	8	10	11	15
S. mutans			12	6	8	15	16	9	11	7	9	14	16
C. albicans	Fungus	Fluconazole	10	10	15	17	20	19	22	21	23	23	25

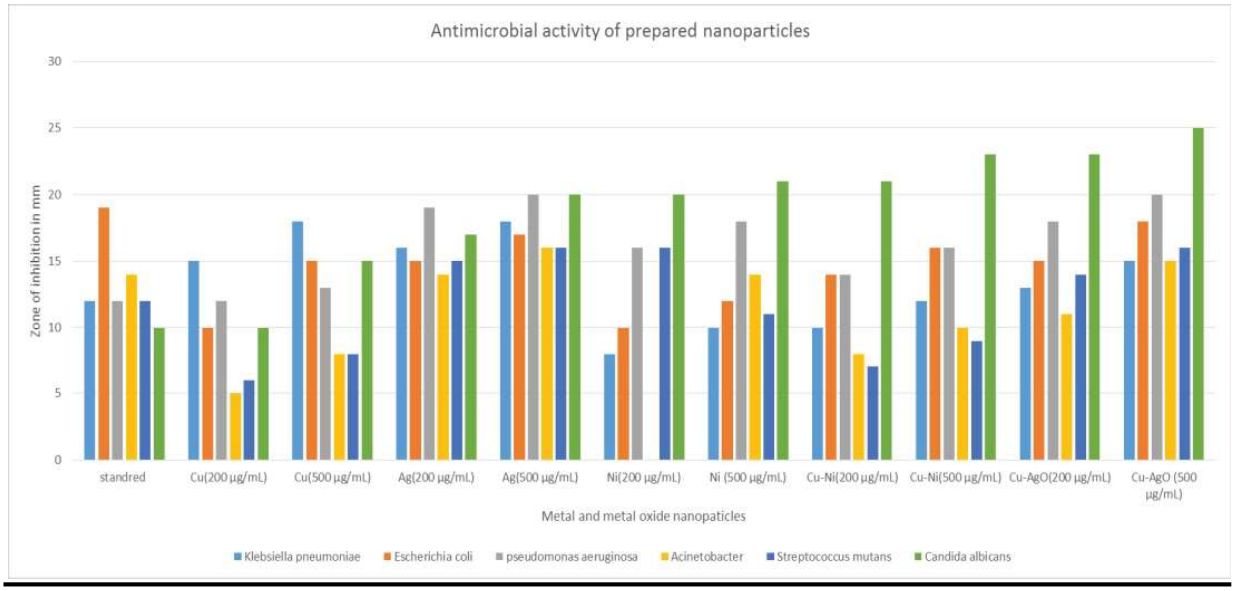

Fig. 5: Graphical illustration of antimicrobial activity of CuO, NiO, Ag_2O, Cu-NiO and Cu-Ag_2O Nps with different concentrations against *Klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa, Acinetobacter, Streptococcus mutans,* and *Candida albicans*

The results indicated that copper oxide, silver oxide and nickel oxide Nps have antimicrobial activity against gram-negative bacteria such as *Pseudomonas aeruginosa, Escherichia coli,* and *Klebsiella pneumonia* and gram-positive bacteria such as *Streptococcus mutans* and *Acinetobacter baumanii* and fungus such as *Candida albicans.* They have larger regions of inhibition on higher concentration e.g., 500 µg/ml and these can be efficiently utilized as the antifungal agent (Chauhan et al., 2020).

There are various systems used to adjust the properties of metals for example doping and alloying. The doping of metals is an alluring method to change the qualities of metals. The doping of different metal Nps has been accounted for and has wide applications in different fields. The fundamental extent of the current investigation is to assess and analyze the antimicrobial action of copper oxide and silver oxide Nps with Cu doped Ag_2O/NiO Nps. The Cu doped Ag_2O Nps and Cu doped NiO Nps indicated vast antimicrobial action against microbes and parasites (Rana and Singh, 2016). Copper doped silver oxide nanoparticles showed more inhibition against *Candida albicans*. Hence it can be concluded that the doped nanoparticles are more significant against fungus as compared to bacteria (Vijayaprasath et al., 2016).

The current study demonstrates that metal Nps such as CuO, Ag_2O, NiO, Cu doped Ag_2O, and Cu doped NiO can have potential to control the antibiotic resistance issue. The precise mechanism behind the antimicrobial activity of metal is unidentified (Prabhu and Poulose, 2012).

The purposed mechanism for the antimicrobial activity of metal oxide nanoparticle is that the metal nanoparticles generate metallic ions and these ions change the permeability and destroy membrane proteins. By this, the cell membrane is damaged and cell contents are leaked out. So, by the dissolution of metal ion and free radicals, the transport of electrons through the microbial cell is stopped and cell death occurs. Due to the significant antimicrobial behavior of the CuO, NiO, and Ag_2O Nps, these are used in the formation of bone cement, sterilization and coating for devices.

Photocatalytic activity

The photocatalytic ability of Cu doped NiO Nps was compared with pure NiO Nps for the degradation of methylene blue (MB) and eriochrome black-T (EBT).

Photocatalytic Degradation of Methylene Blue

Fig. 6 and 7 showed the behavior of UV-Visible absorption spectrum of an aqueous solution of 22.4 micromolar MB against photo catalytic behavior of prepared nanoparticles. The spectra were recoded after different time intervals to check the effect on the degradation behavior of MB. The adsorption peak of MB at 665 nm is characteristic and is measured as a function of light. It can be seen that the adsorption peak diminishes sharply after 30 minutes and completely disappears after 90 minutes by using Cu doped NiO Nps. However, adsorption of the peak using pure NiO shows less reduction intensity than Cu doped NiO catalyst (Chauhan et al., 2020) (Hernández-Gordillo and González 2015; Noua et al., 2019)

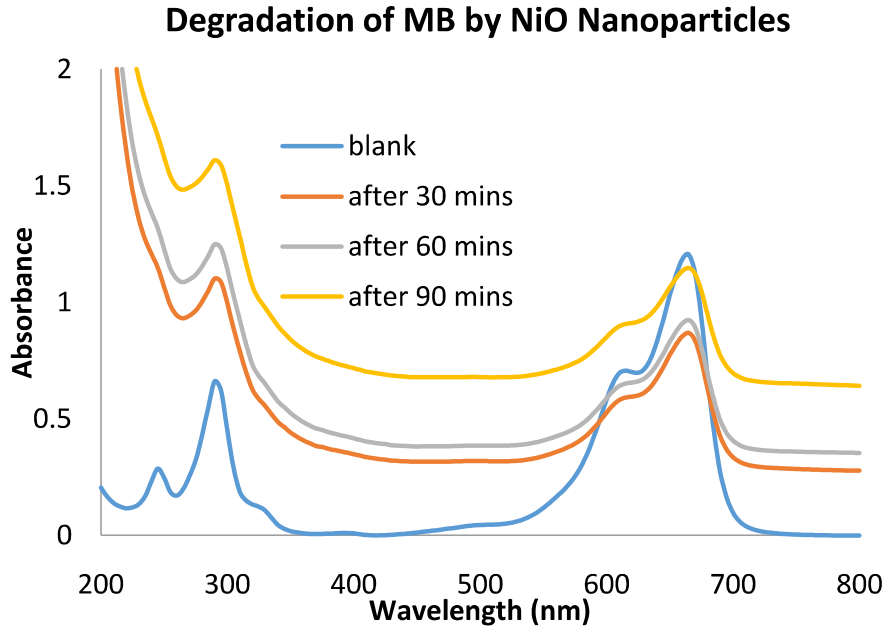

Fig. 6: Degradation of MB by NiO Nps

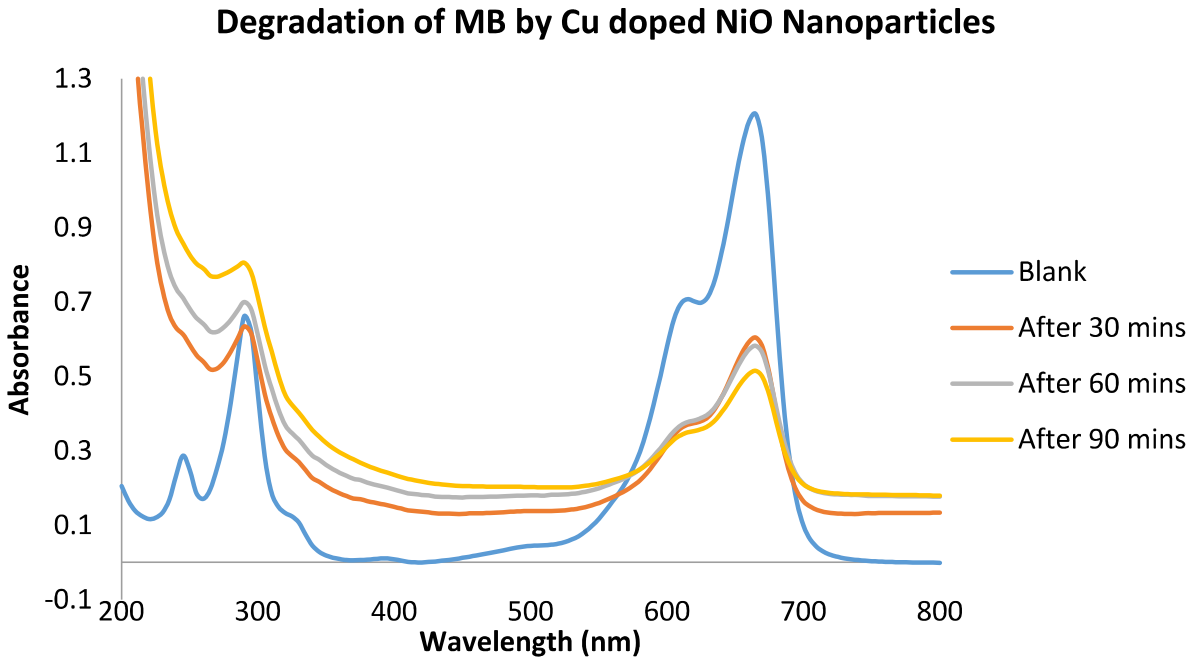

Fig. 7: Degradation of MB by Cu doped NiO Nps

Photocatalytic degradation of eriochrome black-T

Fig. 8 and 9 showed the photo catalytic degradation of EBT using pure NiO and Cu doped NiO photocatalysts respectively. It can be observed from the chart that after different intervals of time the peak height decreases very sharply using Cu doped NiO as photocatalyst compared to pure NiO. The spectra was taken after the intervals of three minutes (Jongnavakit et al., 2012).

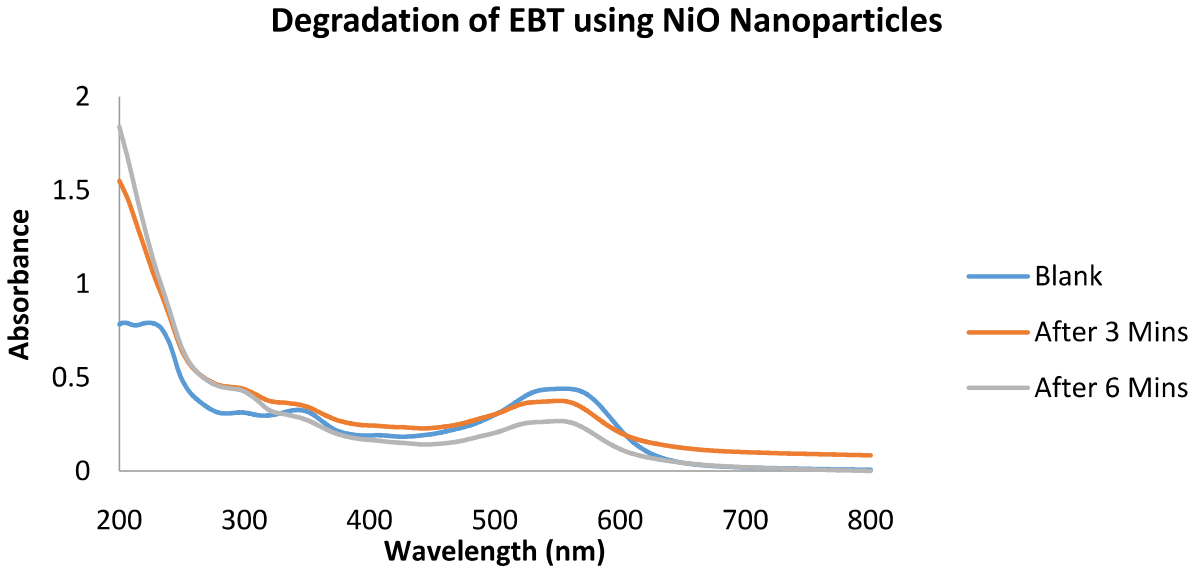

Fig. 8: Degradation of EBT by NiO Nps

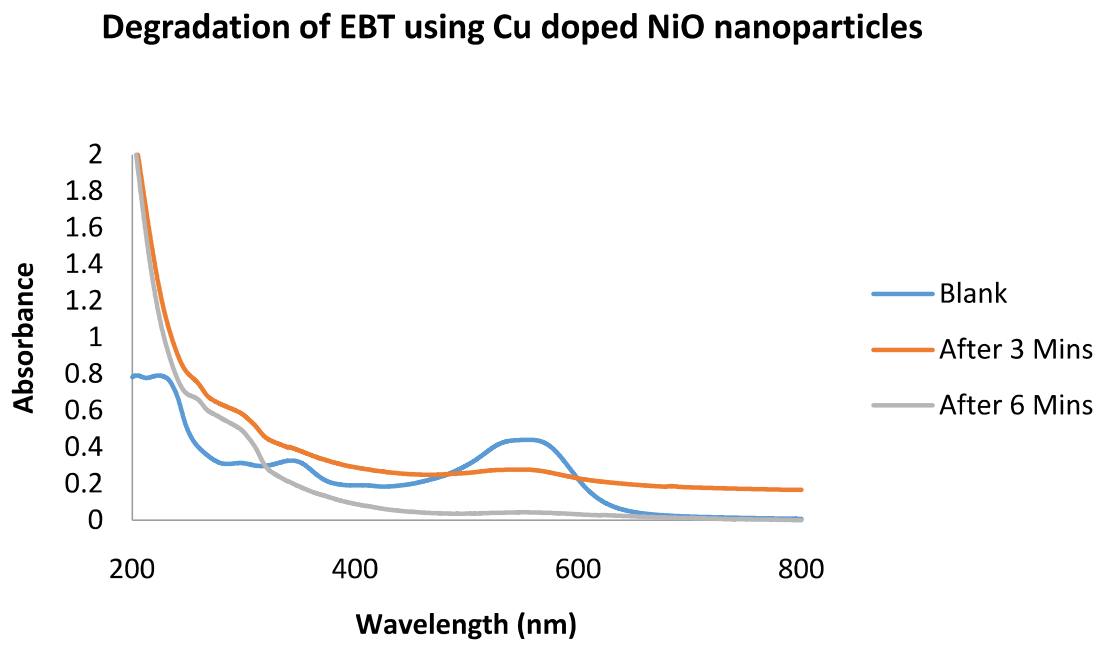

Fig. 9: Degradation of EBT by Cu doped NiO Nps

CONCLUSION

The pure and doped metal oxide nanoparticles were prepared by co-precipitation method. The XRD and DRS spectra confirm the doping of Cu with Ag_2O and NiO Nps. The antimicrobial and photocatalytic activities of prepared nanoparticles were also investigated. The studies showed that in comparison to pure NiO Nps, Cu doped NiO Nps exhibited increased photocatalytic activity towards the degradation of methylene blue (MB) and eriochrome black-T (EBT) dyes under visible light. If we see the zone of inhibition of metal oxide and doped Nps it is clear that the doped nanoparticles are more effective than pure Nps.

ACKNOWLEDGEMENT

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CONFLICT OF INTEREST STATEMENT

It is declared that there is no potential conflict of interest in the current study.

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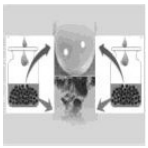

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Prevalence and Risk Factors of Gastritis in Shahdara and Associated Areas

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ABSTRACT: *Gastritis is a painful condition in which the inside surface of the stomach becomes inflamed. The study was conducted from December 2019 to March 2020 on 400 patients. The purpose was to investigate the prevalence of gastritis and its risk factors in local population. The subjects were selected randomly. The questionnaires were filled by them. The questions included the demographical information and contributing factors of gastritis. The result showed that the prevalence of gastritis was 73.5%. Among 294 patients, the prevalence of gastritis in females (65.98%) was higher than in males (34.01%). The mean age of the population was 38.8years ±0.65, the mean height was 160.9cm ±0.74 for females and 163.47 ±0.83 for males, the mean weight was 67.39Kg± 1.0 for females and 69.04 ±1.03 for males and the mean BMI was 25.98Kg/m^2 ±0.35 and 25.87Kg/m^2 ±0.37 for females and males respectively. It was found that there was a significant association between gastritis and contributing risk factors like psychological stress, history of frequent intake of anti-inflammatory drugs, smoking, eating spicy foods, oily foods, taking soft drinks and tea. The common symptoms were heart burning, the bad taste of the mouth, abdominal bloating, indigestion and swelling in the stomach. This study reported high prevalence of gastritis in Shahdara and its associated area. As its prevalence is increasing day by day in Pakistan. Therefore, it is important to investigate prevalence of gastritis as well as its associated risk factors at larger scale to overcome it.*

Keywords: *Gastritis, H. pylori, Risk factors, Symptoms. Prevalence*

INTRODUCTION

The term "gastritis" refers typically to inflammation, erosive state to the abdomen lining tissue with severe pain. It can be acute, lasting for a short duration (1-2 days), or chronic, which develops slowly (Mahmoud et al., 2016). Chronic gastritis is one of the most common lifelong, serious, and insidious illnesses in human beings. More than half of the world's population is affected by this disease (Sipponen and Maaroos, 2015).

Gastritis caused by *Helicobacter pylori* (*H. pylori*), Gram-negative bacteria that colonize the human gastric epithelium (Mujawar et al., 2015) and the risk factors includes alcohol consumption, long intake of drugs (NSAIDs), (Kasper et al., 2006; Varbanova et al., 2014) smoking, tobacco use, spicy food, oily food, stress, swallowed foreign bodies, and infections which leads to excessive inflammation, irritation of mucous membrane and excessive gastric secretion that rupture and inflame the stomach mucosal lining (Nagaraju et al., 2013).

According to traditional classification, *H. pylori* infection can be diagnosed by noninvasive tests such as *H. pylori* antigen in stool specimen, UBT (Urea Breath Test), serology, and invasive tests such as PCR (polymerase chain reaction), culture, and histology (Wang et al., 2013; McMahon et al., 2016). Within developed nations, prevalence rates of H. pylori infection among children have been shown to range from as low as 1.8% to as high as 65% (Okuda et al., 2015). While in developing countries the prevalence is generally higher reaching up to 90% in some countries (Ozbey et al., 2015). The countries with the highest HP burden were Nigeria (83.1%-92.2%), Portugal (84.9%-87.9%), Estonia (75.1%-90.0) %, Kazakhstan (74.9%-84.2%), and Pakistan (75.6%-86.4%) (Hooi et al., 2017).

Gastritis is now becoming a high risk both in developed and developing countries, and the problem seems to rise at a remarkable rate both in children and adults. The present study was conducted to identify the prevalence of gastritis, its risk factors and associated symptoms of gastritis that are prevalent in the population of Shahdara.

MATERIALS AND METHODS

To evaluate the prevalence of gastritis and its contributing factor a random sample of 400 people of different age groups were collected. The study was approved from the ethical committee of Zoology Department of Lahore College for Woman University, Lahore. A cross-sectional study was conducted from December 2019 to March 2020. Data was collected by visiting the Shahdara Teaching Hospital and subjects were enrolled in the study after getting their written consent.

Semi-structured questionnaires were used to obtain the following information:

1. Demographic data including name, age, gender, height, weight, smoking and material status.
2. Information about the patient's medical history included stress and **r**egular use of pain relievers **(**NSAIDs).
3. Information regarding the use of tea, spicy and oily foods, and soda bottles.
4. Contributing symptoms like bad taste, heartburn, vomiting, abdominal bloating and stomach ache, indigestion, constipation, loss of weight, feel swelling in the stomach.

They were asked to assess the items for clarity and straightforwardness. The questionnaire was developed in Urdu as this language is more accessible to volunteers. Standing height was measured using the height measuring tape in the feet. Weight was measured by using the measuring device weight machine. Quantitative Analysis that is BMI of male and female of different age groups was calculated using height in meter squared (m^2) and weight in kilograms (kg). The BMI is calculated by using the formula.

$$BMI\ (kg/m^2) = weight\ (kg)/\ height\ (m^2)$$

Data were transferred to a Microsoft Excel spreadsheet (Microsoft Corp., Redmond, WA, USA) for analysis. Using SPSS 23.0 statistical software, the mean and standard error of the mean was found out for age, height, weight and BMI. The frequency of all risk factors was calculated through SPSS 23.0 and Chi-square test was applied on categorical data to find statistical difference.

RESULTS AND DISCUSSION

The 400 patients were enrolled in this study. 294 patients of the population were affected with gastritis and 106 were not suffering from gastritis. Prevalence of gastritis was 73.5% among the population and the prevalence of gastritis in females (65.98%) was higher than in males (34.01%) as shown in Table 1.

Tale 1: Prevalence of Gastritis in Studied Population

Sr. No.	Prevalence	Total no N=400 (%)	Female n(%)	Male n(%)
1	Gastritis	294 (73.5%)	194 (65.98%)	100 (34.01%)
2	Not suffering from Gastritis	106 (26.5%)	35 (33.01%)	71 (66.98%)

There were 400 patients included in the analysis 229 (57.3%) were females and 171 (42.8%) were males. The mean age of the population studied was 37.6 years ±0.86 for females and 40.42 years ±0.97 for males, the height was 160.9 ±0.74 for female and 163.47 ±0.83 for males, the mean weight was 67.39Kg± 1.0

for females and 69.04 ±1.03 for males and the mean BMI was 25.98Kg/m^2 ±0.35 and 25.87Kg/m^2 ±0.37 for females and males respectively as shown in Table 2.

Table 2: Demographical Data of Studied Population

Sr. No.	Total Patients N=400	Female (n=229) Mean ± S.E.M.	Male (n=171) Mean ± S.E.M.
1	Age (years)	37.6 ±0.86	40.42 ±0.97
2	Height(cm)	160.9 ±0.74	163.47 ±0.83
3	Weight (Kg)	67.39 ±1.0	69.04 ±1.03
4	BMI (Kg/m^2)	25.98 ±0.35	25.87 ±0.37

It was observed that 63% and 13.25% of the studied sample have psychological stress and a history of frequent NSAIDs intake. 1n analysis of overall population dietary habits 54.75% took oily food, 60.25 took spicy food, 58.75% took tea, and 32.50% took soft drinks regularly and 14.75% were a frequent smoker.

In overall population frequency distribution in associated symptoms were; 71% of the people felt acidity or heart burning, 62% felt bad taste of mouth, 24.50% have vomiting problem, 65.25% have abdominal bloating, 45.75% felt stomach ache, 48.75% complained the problem of constipation, 54.50% felt swelling in the stomach and 62.50% felt indigestion after the meal as shown in Table 3.

Table 3: Distribution of the Studied Sample According to the Risk Factors

Sr. No	Risk Factors	Frequency of total Population N=400			
		Yes	Yes %	No	No %
1.	Feel Stress or tension	252	63.00	148	37.00
2.	Take NSAIDs	53	13.25	347	86.75
3.	Eating oily food regularly	219	54.75%	181	45.25%
4.	Eating spicy food regularly	241	60.25%	159	39.75%
5.	Taking tea regularly	235	58.75%	165	41.25%
6.	Using soft drinks	130	32.50%	270	67.50%
7.	Smoking regularly	59	14.75%	341	85.25%
8.	Feel acidity or heart burning	284	71.00	116	29.00
9.	The bad taste of the mouth	248	62.00	152	38.00
10.	Vomiting	98	24.50	302	75.50
11.	Abdominal bloating	261	65.25	139	34.75
12.	Stomach ache	183	45.75	217	54.25
13.	Constipation	195	48.75	205	51.25
14.	Fell swelling in the stomach	218	54.50	182	45.50
15.	Indigestion	250	62.50	150	37.5

A significant association was found between gastritis and psychological stress as 74.83% of the populations who have psychological stress are suffering from gastritis and 17.35% are those who frequently use NSAIDs with significance $P < 0.05$ as shown in Table 4. The findings support other studies, in their conclusion that psychological stress increased the incidence of gastritis and peptic ulcers as it is facilitating other risky behavior (Levenstein et al., 2015; Cheng et al., 2000). Psychological stress causes disturbances in GI physiology, such as altered GI barrier function, changes in motility and secretion, development of visceral hypersensitivity, and dysfunction of inflammatory responses. Furthermore, the study revealed a significant association between NSADs. Several studies supported the study findings; one reported that NSADs are risk factors for gastrointestinal complications especially with the use of anticoagulants, corticosteroids, low-dose aspirin, high-dose NSAIDs and chronic debilitating diseases such as cardiovascular disease. In the female frequent intake of oral-contraceptive pills such as ismila, famila, diane 35, mirena, etc. However, H. pylori infection increases the risk of NSAIDs gastric complications this study is supported by Lanza et al. (2009).

Although few types of research (Broutet, 2002; Rubin et al., 2011) were conducted to assess the association between gastritis and dietary variables, and their findings were in support of the present study, in which a significant association was found between gastritis and intake of tea, soft drinks as 67.35%, 35.71% and59.18%, 71.43% of those who

regularly eat oily and spicy food, respectively, had gastritis ($P < 0.05$). Foods with high-fat act on retardation of gastric emptying and the broths with large quantities of purine raise the acid secretion. Therefore, spicy foods and high-fat foods are not recommended (Ddine et al., 2012; Choi et al., 2015). Spicy food increases gastric secretion and causes constant irritations in the mucosa. The red pepper and paprika raise the acid secretion. The black pepper irritates raising secretions and producing dyspepsia. The chili pepper and mustard cause erythema and gastric lesio (Reis et al., 2003). The food affects gastric motility and acid secretion. A very hot intake leads to congestion of mucosa and raises the secretion of acid and decreases the time of evacuation. The soft drinks decrease the pressure beneath the esophageal sphincter and can produce gastro-esophageal reflux. The nicotine also decreases this pressure and induces hyperchloremia (Mahmoud et al., 2016).

Table 4: Association of Risk Factors with Gastritis

Sr. No.	Risk factors	Gastritis n=294				Gastritis free n=106				χ2	P
		Yes	(%)	No	(%)	Yes	(%)	No	(%)		
1.	Psychological Stress	220	74.83	74	25.17	32	30.19	74	69.81	66.61	0.001
2.	Take NSAIDs	51	17.35	243	82.65	2	1.89	104	98.11	16.2	0.00
3.	Take oily food	174	59.18	120	40.82	45	42.45	61	57.55	8.8	0.003
4.	Eat spicy food	210	71.43	84	28.57	31	29.25	75	70.75	57.89	0.001
5.	Take Tea	198	67.35	96	32.65	37	34.91	69	65.09	33.83	0.000
6.	Soft drink	105	35.71	189	64.28	25	23.58	81	76.42	5.23	0.02
7.	Smoking	54	18.37	240	81.63	5	4.72	101	95.28	11.5	0.001
8.	Feel acidity or heart burning	247	84.01	47	15.99	37	34.91	69	65.09	91.25	0.001
9.	The bad taste the of the mouth	235	79.93	59	20.07	13	12.26	93	87.74	151.4	0.001
10.	Vomiting	90	30.61	204	69.39	8	7.55	98	92.45	22.4	0.001
11.	Abdominal bloating	253	86.05	41	13.95	8	7.55	98	92.45	211.8	0.001
12.	Stomach ache	174	59.18	120	40.82	9	8.49	97	91.51	80.67	0.001
13.	Constipation	179	60.88	115	39.12	16	15.09	90	84.91	65.38	0.001
14.	Fell swelling in the stomach	218	74.15	76	25.85	0	0.00	106	100.0	172.7	0.001
15.	Indigestion	238	80.95	56	19.05	12	11.32	94	88.68	161.2	0.001

Table 4 shows the association between smoking and gastritis was significant. That could be explained as smoking reduces the synthesis of prostaglandin in the gastric mucosa and decreases the barrier function of the gastric mucosa. The resulting finding coincides with a study that reported that an increased risk of severe atrophic gastritis and intestinal metaplasia was statistically associated with smoking (Nakamura et al., 2002; Rosenstock et al., 2003). So this study is in support of this study as a significant association between smoking and gastritis was observed.

The associated symptoms such as heartburn, the bad taste of the mouth and abdominal bloating after eating were more prevalent this study is supported by Andersen et al. (1988). Many of them experienced constipation, felt vomiting, experienced swelling in the stomach and indigestion. All these factors are more prevalent among the gastritis population than in the population not suffering from gastritis. This shows that all these symptoms are associated with gastritis.

CONCLUSION

It was concluded from the study that the prevalence of gastritis was common in Shahdara and its associated areas. The most common symptom related to its prevalence in population were heart burning, the bad taste of the mouth, abdominal bloating, indigestion and swelling in the stomach.

Females were more affected than males. It was found that *H. pylori* infection, psychological stress, frequent intake of NSAIDs and smoking were the leading cause of gastritis.

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Tracheal Collapse in a Beetal Goat – First Case Report in Pakistan

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ABSTRACT: *A female Beetal goat, 4-years-old was brought to the Outdoor Hospital of University of Veterinary and Animal Sciences Lahore, Pakistan. The goat when presented at the hospital was noticed restless and was unable to stand. Temperature was subnormal (98˚F) and respiratory stridors were evident during respiration. Signs of severe dyspnea with foamy salivation and dilated pupils were also evident. Mucous membrane and tongue were cyanotic. At postmortem, presence of foamy secretions in the cranial airways, including nostrils were observed. Lungs were congested and edematous. Most predominant finding was tracheal rings with pronounced distance between their dorsal edges with cartilage damage and totally collapsed trachea extending up to bifurcation. This finding was corresponding to tracheal collapse grade IV. This is the first published report of tracheal collapse in goats in Pakistan.*

Keywords: *Beetal, goat, tracheal, collapse, Pakistan.*

CASE HISTORY AND CLINICAL MANIFESTATIONS

A female Beetal goat, 4-years-old was brought to the outdoor Hospital of University of Veterinary and Animal Sciences Lahore, Pakistan. The goat had parturited and delivered two healthy kids 20 days ago. The goat was kept in clean backyard, fed green fodder and grains as concentrate, and had unknown history of deworming. The physical condition of the goat was weak with rough hair coat and dander. The owner had complaint for choking (esophageal obstruction). The animal when presented at the hospital was first seen restlessness and was unable to stand. Respiratory stridors were evident during respiration audible even at

distance. There was severe dyspnea with subnormal temperature (98˚F) and the Pulse rate was 68/minute. On auscultation rhonchi and stridor sounds were heard. There was foamy salivation and pupils were dilated. Mucous membrane and tongue were cyanotic.

INITIAL TREATMENT ATTEMPTED AND FURTHER INVESTIGATION

At this stage the animal was injected intravenously with Atropine sulfate at 0.5mg/kg body weight. Following injection palpated for the choking but no evidence was found for choking. However during palpation, surprisingly, the trachea was found flattened rather circular hollow structure. It was decided to inject prednisolone and aminophylline, and then to refer the animal to the surgery clinic but goat collapsed to slaughter without giving chance to administer this treatment.

At postmortem, presence of foamy secretions in the cranial airways, including nostrils were observed. Lungs were congested and edematous. Most predominant finding was, tracheal rings with pronounced distance between their dorsal edges with cartilage damage and totally collapsed trachea extending up to bifurcation (Fig. 1 and 2). Blood clot was also recovered from lower trachea on excision. This finding was corresponding to tracheal collapse grade IV.

Fig. 1. Snapshots of grade IV tracheal collapse in Beetal goat. Notice the dislocation of cartilaginous rings from dorsal free edges.

Fig. 2. Snapshots of grade IV tracheal collapse in Beetal goat. Notice the constricted lumen of the trachea.

DISCUSSION

Beetal goat is traditional breed in Punjab province of Pakistan and is famous for milk and meat production (Iqbal et al., 2008; Ramzan et al., 2020). The salient features of Beetal goat include height at withers as 90 cm and 81 cm for adult males and females, respectively (Hasnain, 1985; Iqbal et al., 2013) and body weights 65 kg and 45 kg for adult males and females, respectively (Devendra and Burns, 1983; Eyduran et al., 2017). The milk yield is 195 kg in 224 days (Devendra and Burns, 1983; Prasad et al., 2005). Beetal goats play key role in supporting millions of people who are poor, landless and living in the rural areas. It is also called as "Poor man's cow.

Tracheal collapse is the obstruction in the wind pipe due to collapse (Hedlund, 1991; Jerran and Fossum, 1997). Initially, there is laxity of the trachealis muscle which causes coughing and sounds during breathing and as the condition progresses dorso-ventral flattening takes place. This dorsoventral flattening results in appearance of more prominent and severe signs of coughing and dyspnea (Deweese and Tobias, 2014). It has been reported in dogs, cats and cattle especially in young calves (Hawkins et al., 1998). In dogs, tracheal collapse involves either the cervical or the thoracic tracheal area

(Fingland et al., 1990; Ettinger et al., 1992). In calves, the caudal cervical and thoracic sections of the trachea are most affected (Fingland et al., 1990). Different etiologies for tracheal collapse have been proposed which include congenital malformations, genetically induced tracheal weakness or nutritional deficiencies (Hawkins et al., 1998). The majority of the cases have been reported in the calves as well as dogs and cats in mid- and elderly age (Ettinger et al., 1992). The congenital form of the disease in dogs is related with malformation of the ring structure of the trachea however in the acquired form the rings lose their ability to stay firm and finally collapse (Ettinger et al., 1992). Siger et al. (1998) has also reported tracheal collapse in the horses.

The collapse is classified and graded by the degree of diminution of the lumen of the trachea Grade I (25% reduction), grade II (50%; pendulous membrane and relaxed cartilage), grade III (75%; membrane almost in contact with the ventral wall), and grade IV (lumen almost obliterated).

The typical signs of tracheal collapse are cough, dyspnea, restlessness, exercise intolerance, tachycardia and cyanosis (Rings, 1995; Jerran and Fossum, 1997). Animal is exercise intolerant and a light exercise can induce severe dyspnea and restlessness. A correct diagnosis can be achieved by tracheal palpation, radiography, and endoscopy.

Treatment may be medical and surgical or both but neither medical nor surgical are cure of the disease (Ettinger et al., 1992; Rings, 1995; Jerran and Fossum, 1997). However the history, physical condition and severity of signs all contribute in the decision of line of treatment. According to Chisnell et al. (2015) in dogs severe cervical tracheal collapse treated with extra-luminal ring available commercially had a positive impact in overall improving quality of life

In this case initial diagnosis was chocking by foreign body which is common in goat but finding the trachea collapsed was unexpected as the animal had never shown any signs before. Macroscopically there was no deformity in the trachea which shows there was not a congenital or nutritional cause behind tracheal collapse rather it was due to increased respiratory stress.

CONCLUSION

This report is important as tracheal collapse has never been reported in adult goats in Pakistan thus establishing one more differential diagnosis in the diseases which cause severe dyspnea and cyanosis. Hence this is the first published report of tracheal collapse in goats in Pakistan.

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Influence of Abiotic Factors on Classroom Environment and Students Learning

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ABSTRACT: *Classroom is a place where student learn numerous skills, knowledge, generate new thoughts and ideas as well as increase their abilities towards affective learning. However, it is noticed school systems are running with dark, congested classrooms that affects student's learning. The present cross sectional study was designed to assess effect of abiotic component of classroom environment on the students learning. 175 students of Lahore school of nursing at The University of Lahore were considered. Convenience representative method was used. Sample size was 122 according to Slovins' formula. 41% of the respondents were agreed that proper lightning and temperature of class room plays an essential role in the learning of students and they learned in more suitable way and can enhance their comprehension field. It was noticed that student's performance and learning enhanced by properly arranging class room environment especially abiotic factors such as light, temperature and air conditions. It was concluded that students are worth of any organization and for proper utilization of their skills it is very important to focus on class room environment*

Keywords: *Learning, Effect, Environment, Students, Light, Temperature, Abiotic Factors*

INTRODUCTION

Classroom is a place where students learn numerous skills, knowledge, generate new thoughts and ideas as well as increase their abilities towards effective learning (Burke, 2013). It is evident that schools play vital role in

the development of nations, it is evident that this role of schools has great worth and play vital part in educating the upcoming age group about how to become victorious individuals of community, so every action needs to be exercised to ensure that the educational environment should help the students excel (Campbell, 2008). Physical surroundings play an important role in enhancing learning, knowledge and skills capture the attitude of students accordingly as well as a comfortable, quiet and calm environment fosters learning among students (Hadjioannou, 2007).

At the present era, as the world is progressing rapidly with the advanced technology, people want to live comfortably and it becomes more crucial in a point of learning (Campbell, 2008). Nowadays, people look for the institutions that provide a comfortable and learning environment, as it is said always sit in a quiet place when you are studying or doing written work, doing so enhances the mental ability and focus on the task (Cornelius et al., 2014). For the success of students it is mandatory to have a comfortable and quiet environment to foster their learning. Studies show that the educational atmosphere can have a significant influence on the outcome of learners and also on their emotional responses to the happening, tutor, content provided, and organization overall (Campbell, 2008). According to Wakefield et al. (2002) 30-40% schools have poor indoor air quality as reported by Government Accountability Office.

Many factors can influence the atmosphere in terms of learning and suppress imagination or do not encourage a healthy educational atmosphere which include material components like temperature, light and air. Moreover, there are untouchable components like the zeal of the classroom, the laws, or the noises inside the room (Hadjioannou, 2007). There are many factors which influence a learner's attention and attainment in the class. They may also influence the instructor's behaviour in the class. All of these factors of the classroom involve a psychological environment. The manner in which the instructors conduct their class, or the manner they handle it, can have healthy and unhealthy effects for their students (Kephart et al., 1954).

This cause and consequence is crucial for tutor to understand to know how to arrange their classroom to provide a best educational atmosphere. Some aspects affect the classroom environment and have also an effect on learning like music, lighting, temperature and convenient sitting conditions of classroom atmosphere which are crucial for building warm and embracing atmosphere thus enhancing the gaining of knowledge and reducing the feeling of helplessness and uneasiness (Lindblad, 1994). The atmosphere (light, temperature, air) of the

classroom is the topmost aspect that has a measureable influence on learner's performance (Cheng, 1994). All these factors have an important part in evaluating if the classroom is learner-centered or not. Separately each factor does not have a significant impact but collectively they may function to enhance the capability of a learner to learn. (Guardino et al., 2010). The aim of the research was to evaluate the effect of abiotic factors on the classroom environment on students learning in the students of Lahore school of nursing at the University of Lahore.

MATERIALS AND METHODS

The quantitative cross-sectional illustrative analysis method was adopted in this research to evaluate the effect of the physical components of classroom environment on the students learning. Only 175 participants of Lahore school of nursing at The University of Lahore. All the students who were outside of Lahore School of Nursing were excluded from the study. Simple representative method was adopted to gather information from the study participants. The total sample samples 122 according to which was calculated by applying Slovins' formula $\mathbf{n = N/1+N (E)^{2.}}$

Statistical parameters such as age, sex, matrimonial status, qualification, etc. were examined. Percentages have been determined for categorical data whereas continuous data will be analyzed through mean and standard deviation.

Sample Size Calculation

$\mathbf{n= N/1+N (E)^{2}}$

At 95 % confidence interval

$n= 175/1+175(0.05)^2$

n=122

SCHEME OF ASSEMBLING DATA

A Questionnaire was adapted from Fraser, (2012) and utilized to gather information on classroom environment. All queries were in accordance with Likert which were circulated between the learners to test the response of nursing students about the classroom environment.

STATISTICAL ANALYSIS

Data was examined utilizing SPSS version 22.0 statistical software. Descriptive statistics were used to assess the frequency, percentage, mean and standard deviation

RESULTS

For demographics analysis 3 questions were prepared and data were analyzed by finding Normality test and Reliability and Validity analysis. It was noticed that 58.2% (71) participants were with 18-25 years of age, and 41.8% (51) of 26-35 years of age. Gender wise 27% (n=33) of the respondents were male and 73% (n=89) of the respondents were female. For qualification criteria, 44.3% (n=54) of the respondents were qualification up to Post RN and 55.7% (n=68) of the respondents were qualified up to BS Nursing (Table 1). Normality was examined through skewness, kurtosis and bar graphs (Munro, 2005). Values of Knowledge, attitude and practice were distributed normally and were well in the