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Assessment of Pathogenic Micro-Organisms that Triggers Occurrence of Nosocomial Infection in Public Hospitals in Gombe Metropolis, Gombe State, Nigeria.

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Abstract

Pathogenic microorganisms are infectious in nature, they usually deteriorate the condition of admitted patients and cause a financial burden on patient relatives and the government. The aim of the study is to assess Pathogenic Micro-Organisms that Triggers Occurrence of Nosocomial Infection in Public Hospital in Gombe Metropolis, Gombe State, Nigeria, both primary and secondary data was used for this study and a total number of 108 copies of the questionnaire were administered and also 36 swabbed samples were collected on different surfaces within the vicinity of the public healthcare institutions in the study area. Data was analysed using descriptive statistical tools and the Relative Importance Index (RII) as well as laboratory analysis through culturing. Pathogenic bacteria such as Staphylococcus aureus, Proteus spp, Escherichia coli, Enterococcus spp, Klebsiella spp were the microorganisms that were found Screened pathogenic microorganisms Enterococcus spp was the most prevailing, followed by 20% Staphylococcus aureus, 17% Proteus spp, and the least pathogenic microorganism was Escherichia coli. The factors that facilitate the transmission of Nosocomial Infection were determined using the Relative Importance Index (RII) where the unavailability of toilet facilities in hospitals, lack of adherence to infection prevention guidelines and filthy toilets are the most significant factors that trigger the spread of Nosocomial Infection. Therefore, the study concluded that Pathogenic microorganisms are still deteriorating the condition of admitted patients in health institutions and that affects the optimism of patients concerning speedy recovery from their ailments, while healthcare workers also become victims of nosocomial infection due to lack of participation in conferences/seminars designed to nurture them on the recently discovered techniques/principles of infection prevention and control.

Keywords: Pathogenic, Nosocomial, Infection, Patient, Health

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INTRODUCTION

Infections refers to the invasion of microorganisms into host tissues with the capability of procreating and multiplying the organism accompanied by a manifestation of signs of illness such as fever and inflammation (Department for Health and Ageing, Australia, [DHAA] 2017). Whereas Nosocomial infection (NI) can be defined as an infection acquired in a hospital by a patient who used to be admitted for a reason other than that infection. On the other hand, can be seen as an infection contracted by patient in a medical institution or different health care facility in which the infection was once no longer current or incubating at the time of admission (World Health Organisation, [W.H.O] 2002).

Khan, Baig and Mehboob (2017) reiterated that these infections can show up during healthcare transport for different ailments and even after the discharge of the patients. Health care-associated infections (HCAIs) are infections that occur while receiving health care in hospitals or other medical facilities, which first appear within 48 hours or more after a patient is admitted into a hospital, or within 30 days after having received health care (Haque, Sartelli & Abu Bakar, 2018).

Bereket et al. (2012); and Reddy, John, Devi and Kumar (2015) affirmed that the term Nosocomial applies to any disease contracted by means of a patient whilst under medical care. More precisely, nosocomial infections additionally known as health care-associated/acquired infections (HAI) are those infections that develop in a sick person who is in a hospital or any different type of medical amenity, for the duration of his/her stay in a healthcare facility. This type of infection may also turn out to be clinically obvious both through the hospitalization and after discharge.

Microbial flora may contaminate objects, devices and materials which subsequently contact susceptible body sites of patients and that will result in severe illness or even death. In addition, new infections associated with bacteria such as waterborne bacteria or viruses and parasites continue to be identified and are of serious health threat to humanity (WHO, 2002).

Moreover, Mwamungule et al., (2015), revealed that Nosocomial Infections are a serious public pathological menace in developing countries especially the African Continent where both capital and human resources are insufficient in the health sector. Despite progress in public health and hospitalization, infections still develop in hospitalized patients and also affect hospital staff in Africa (Jenkins, 2018).

Gombe metropolis remain the hub of healthcare facilities and services of the entire Gombe State thus receiving a lot of challenges that greatly affect the health sector and influence the healthcare system across the state through outbreak of epidemic and endemic diseases. Moreover, healthcare centres within the metropolis are experiencing an unprecedented inflow of patients due to the insurgency in the neighbouring States specifically Borno, Yobe and Adamawa which partially depend on Gombe State for other health care services.

The objectives of the study are to

i. assess the pathogenic micro-organisms that trigger occurrence of Nosocomial Infection in public hospital in the study area
ii. examine the environmental factors responsible for nosocomial infections in the study area;

The level at which infectious diseases are emanating and spreading in health institutions globally is alarming, this leads to complicated health conditions in patients, increasing the burden of medical bills of patients on family and relatives and also metamorphoses of health

conditions into complex diseases and illnesses. The state receives a lot of challenges especially in the health sector where both health workers and health facilities are inadequate or insufficient. Infection prevention and control (IPC) is a universally relevant component of all healthcare systems and without proper surveillance of infection it may affects the health and safety of both people who use the services and those who provide them (WHO, 2016).

METHODOLOGY

Study Area

Gombe metropolis is located between Latitudes $10^{0}15'N$ - 10^{0} 19'N and between Longitudes 11^{0} 07'E - 11^{0} 15'E (see figure1). It is bounded by Kwami Local Government Area (L.G.A) to the North, Akko L.G.A to the Southwest and Yamaltu Deba L.G.A to the East (Abashiya et al., 2017). Gombe metropolis has a tropical continental type of climate, classified as Koppen's Aw, it is characterized by strong rainfall seasonality with distinct wet and dry seasons (Oladipo, 1995). Thus, temperature and other climatic parameters greatly trigger the spread of infectious diseases in the study area especially during the rainy season and also during the harmattan season.

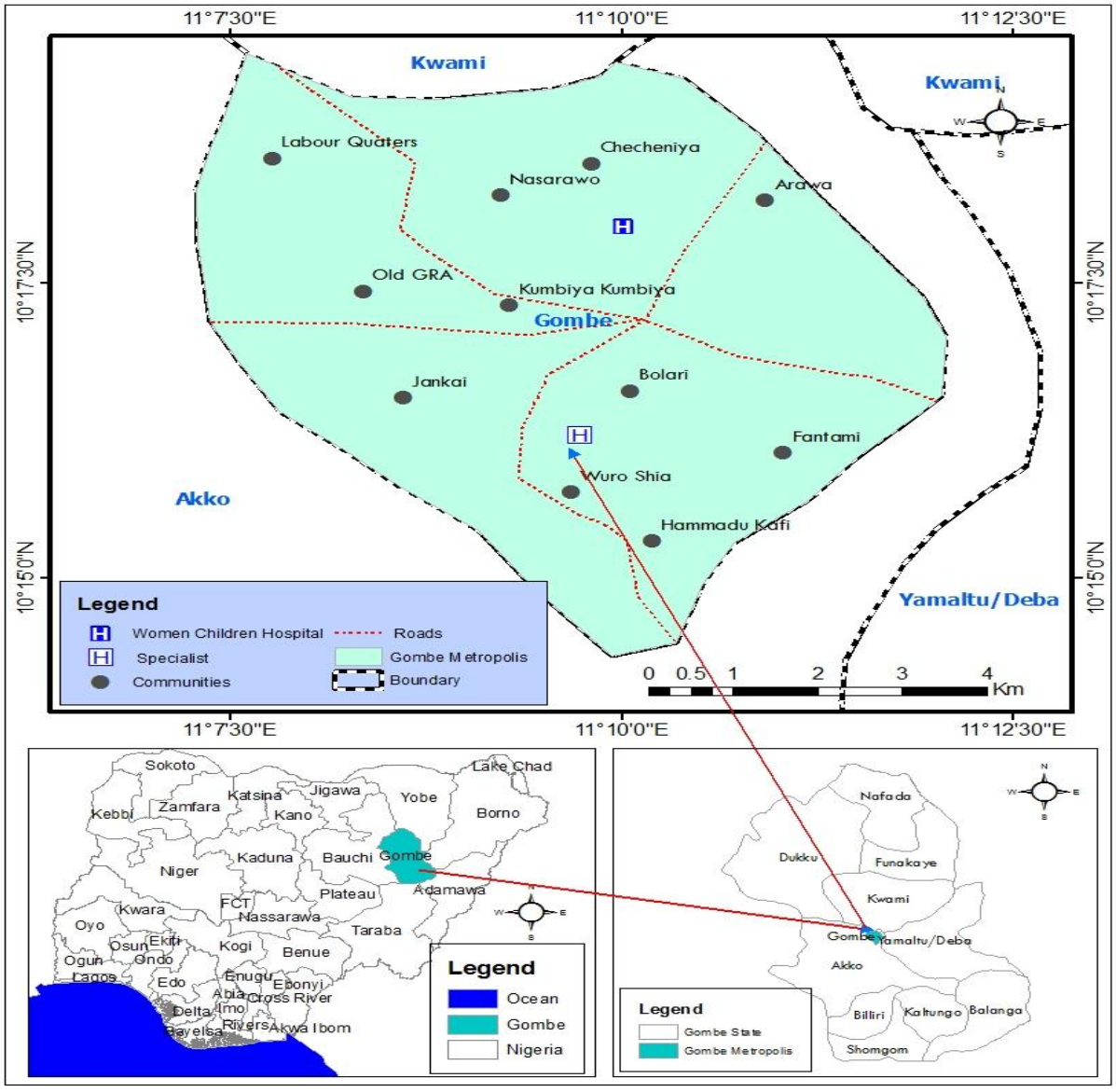

Figure 1: Map of Gombe State Showing Gombe Metropolis.
Source: GIS Lab Department of Geography ABU Zaria Using ArcGIS 10.3 Software.

MATERIAL AND METHOD

i. Sterile swab sticks
ii. Hand gloves
iii. Facemask
iv. Permanent maker
v. Writing materials
vi. Peptone water
vii. Foil paper
viii. Petri dish
ix. Chrome agar
x. Water
xi. Normal saline

The study employed a purposive sampling technique in selecting the wards/Units in the healthcare facilities and also disproportionate sampling was used in determining the required number of questionnaire administered to respondents that are willing and capable of providing the necessary information required for the research as well as convenient sampling technique was used in administering the questionnaire to the health workers. Moreover, 72 questionnaires were administered at State Specialist Hospital Gombe while 36 questionnaires were administered at Zainab Bulkachuwa Women and Children Hospital Gombe and also 36 swab samples were taken from different surfaces within the units selected in the healthcare facilities for the study.

The research exempted the following units Outpatient Department (OPD), Accident and Emergency (E&A), theatre room, laboratory and purposively selected the following units Amenity, Paediatric, Surgical Male & Female Wards, Maternity (post-delivery), Obstetrics and Gynaecology because patients are usually not admitted for more than 48 hours in the former. To establish the occurrence of NI in the facility patients have to be admitted beyond the aforementioned hours which is a major yardstick in this kind of study.

The Primary data for the study was sourced through the administration of questionnaire to healthcare workers, in-depth interviews and swab samples from the surfaces within the healthcare facilities. The Secondary data was sourced from the surveillance units of the public health institutions in the study area, i.e. the State Ministry of Health records, where the targeted health institutions were identified. Relevant materials such as textbooks, journals, Newspapers and published and unpublished research works among others were used for the literature review.

Sample collected

During the research 36 swabbed samples were collected and four samples from each of the nine wards selected between healthcare facilities under study (State Specialist Hospital and Zainab Bulkachuwa Women and Children Hospital Gombe) thus as stated earlier the samples was taking to department of Pharmaceutical Microbiology laboratory Gombe State University for the experiment. Moreover, after the entire process of the experiment had been carried out, five pathogenic microorganisms were identified which include *Enterococcus spp, Escherichia coli, Klebsiella spp, Proteus spp and staphylococcus aureus.*

Microbial Culture

Table 1: Proportion of Swab Samples collected for Microbial Culture

Ward/Units of Sample Collection	No. of Samples
Maternity (Post-Delivery	4
Obstetrics and Gynaecology	4
Amenity	4
Obstetrics and Gynaecology *	4
Female Medical *	4
Paediatric *	4
Male Surgical	4
Paediatric	4
Female surgical	4
Total	**36**

Source: author's computation (2021)

** Note: The only Wards selected in Zainab Bulkachuwa Women and Children Hospital.*

Table 1 show the proportion of samples collected from each ward as well as the specific surfaces where samples were collected in the study area. The research considered or divided each ward in to four quadrants where a sample was taken from each quadrant at the specific surfaces of interest i.e. door knob, pillow case, bed sheet and bed rail.

Table 2: Number of samples collected on FTS in State Specialist Hospital Gombe

Surfaces of Sample Collection	No. of Samples
Door knob	6
Bed rail	6
Bed sheet	6
Pillowcase	6
Total	**24**

Source: author's computation (2021)

Table 3: Number of samples collected on FTS in Zainab Bulkachuwa Women and Children Hospital, Gombe

Surfaces of Sample Collection	No. of Samples
Door knob	3
Bed rail	3
Bed sheet	3
Pillowcase	3
Total	**12**

Source: author's computation (2021)

Table 2 and Table 3 depicted the specific number of samples collected on the frequently touched surfaces (FTS) (door knobs, bed rails, door knobs and pillow cases) are the surfaces considered during the swab samples collection, where 36 different swabbed samples were collected from both healthcare facilities under the study. The samples were collected through the use of sterile swab sticks that were wet with normal saline in order to attract the targeted pathogenic bacteria. Then, the samples taken from the identified surfaces and were conveyed to the Department of Microbiology and Biotechnology of the Faculty of Pharmaceutical Science laboratory for culturing with the diluted prepared chrome agar which was already on the petri dish, so as to ascertain and identify the presence of pathogenic microorganisms that

may be responsible for the spread of the infectious diseases in the study area. The samples spent 48 hours (two days) in the incubator under a maintained temperature of 37^0 C.

RESULTS AND DISCUSSION

This section discussed and interpreted the result of the data obtained during the research, the data was presented in the form of charts and tables.

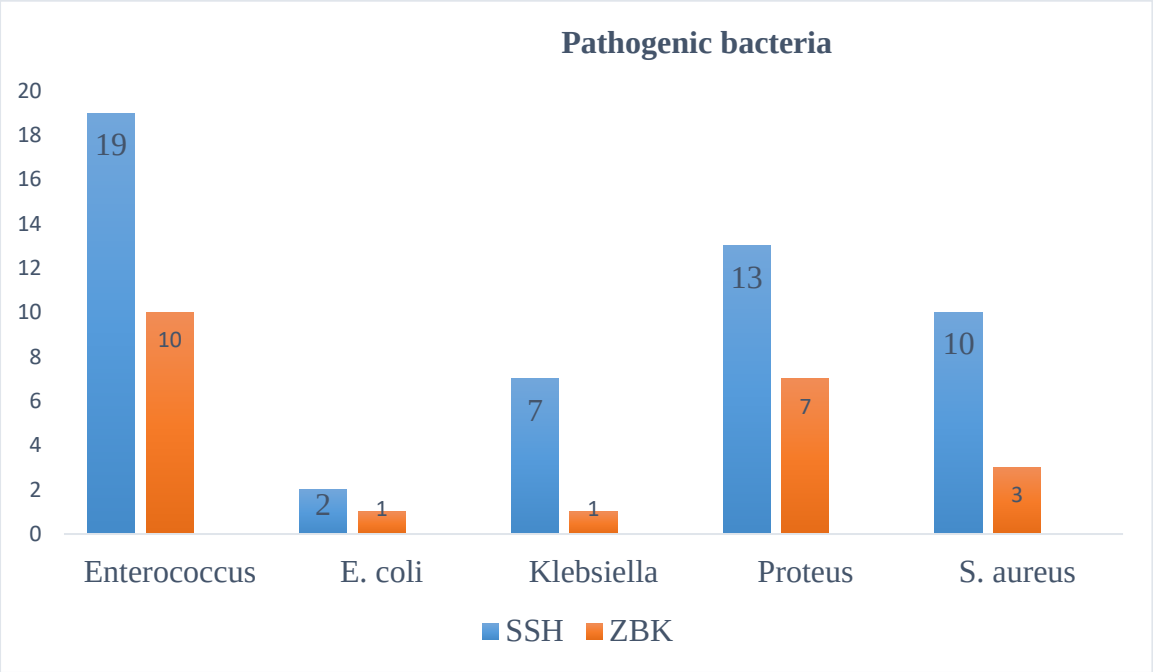

Figure 2: Pathogenic Microorganism
Source: Author's field work (2021)
Note SSH=State Specialist Hospital Gombe
ZBK=Zainab Bulkachuwa Women and Children Hospital Gombe

Figure 2 reveals that *Enterococcus spp* was the most commonly identified pathogenic microorganisms, out of the 36 swabbed samples, 19 samples indicated positive for E*nterococcus spp* in State Specialist Hospital (SSH) and 10 samples also indicated positivity to *Enterococcus spp* in Zainab Bulkachuwa women and hospital (ZBK). Moreover, Proteus *spp* was the second most identified pathogenic microorganism where 13 samples were positive for *Proteus spp* in SSH while 7 samples indicated positive for *Proteus spp* in (ZBK)

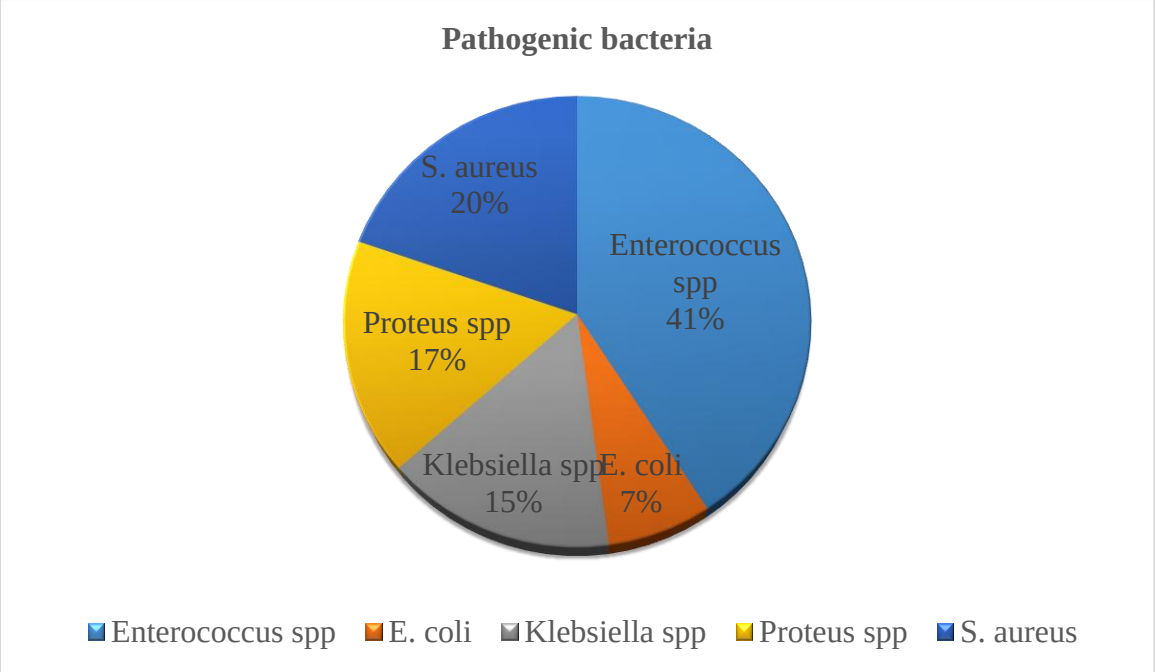

Figure 3: percentage of pathogenic bacteria
Source: Author's experiment

Figure 3 shows that 41% of the screened pathogenic microorganisms are *Enterococcus spp,* followed by 20% *Staphylococcus aureus*, 17% *Proteus spp*, and the least pathogenic microorganism was *Estrichiaria Coli.* The findings of this study contradict Ulger, (2015) the study reveals that 66.7% of the identified pathogenic microorganism are *Staphylococcus aureus* while *Enterococcus spp* was among the least identified pathogenic microorganisms. In addition, Razine et al. (2012) and Angus et al. (2016) in their studies reveals that *Staphylococcus aureus* was the most commonly identified pathogenic microorganism followed by *Escherichia coli*, in their respective findings. Moreover. Akbari, Fattahi & Fazeli, (2018) reported that staphylococcus aureus was the most prevalent pathogenic microorganism This implies that pathogenic microorganisms are still growing on surfaces in healthcare institutions and are causing more harm to patients and healthcare workers which directly or indirectly jeopardized the optimism of quick repercuration.

Table 4: Factors Responsible for Nosocomial Infection

Factor	SD %	DA %	NT %	AG %	SA %	RII	RANK
Unavailability of toilet facilities in hospital	1.0	1.9	6.8	45.6	44.7	0.86	1
Filthy toilet facilities in healthcare	1.0	1.9	3.9	51.5	41.7	0.86	1
Lack of adherence to infection prevention guidelines	1.0	1.9	10.7	35.0	51.5	0.86	1
Poor waste management practices in hospitals	0.0	5.8	8.7	38.8	46.6	0.85	2
Insufficient water supply	0.0	14.6	5.8	27.2	52.4	0.83	3
Lack of environmental cleaning and hygiene in hospitals	1.0	8.7	5.8	41.7	42.7	0.83	3
Poor water system in healthcare facility	1.0	11.7	4.9	46.6	35.9	0.81	4
Contaminated Fomites are reservoirs	2.9	1.0	17.5	44.7	34.0	0.81	4
Filthy contaminated surfaces in hospitals	2.0	2.0	18.6	45.1	32.4	0.80	5
Contaminated and unsterilized equipment in the healthcare facility	1.0	4.9	8.7	33.0	52.4	0.79	6
Water closet toilet is the best for healthcare facilities	2.9	3.9	19.4	51.5	22.3	0.77	7
Nature of food ingested by an inpatient	1.9	9.7	20.4	40.8	27.2	0.76	8

Water quality	7.8	15.5	31.1	29.1	16.5	0.66	9
Congregation of patients in healthcare facility	13.6	16.5	19.4	31.1	19.4	0.65	10
Inadequate ventilated wards	20.4	8.7	22.3	26.2	22.3	0.64	11

NOTE: SD=strongly disagree DA=disagree NT=neutral AG=agree SA=strongly agree
Source: Field work (2021)

Table 4 reveals finding of the study on attributed factors responsible for transmissions NI, lack of adherence to infection prevention guidelines, lack of good toilet facilities and inadequate toilet facilities in hospitals are the most significant factors that facilitate the transmission of hospital-acquired infection in the study area looking at the degree of ranking of RII, considering the aforementioned most significant factors. Thus, the study realized that standard infection prevention guidelines are a very crucial mechanism in mitigating the menace of nosocomial infection as well as providing sufficient toilets facilities in healthcare institutions. Ogunsola and Mehtar, (2020) reiterated the significance of good toilet facilities, sufficient water supply and standard prevention and control guidelines in averting the menace of nosocomial infection in healthcare facilities.

The Relative Importance Index (RII) reveals that good toilet facilities in healthcare institution minimise the incidence of nosocomial infection and availability of toilet facilities in hospitals is paramount in infection prevention and control are very significant factors in curtailing and mitigating the menace of nosocomial infection on the other hand, the RII indicates that lack of adherence to infection prevention guidelines in healthcare facility is also a significant factor that triggers the occurrence of nosocomial inflation. Moreover, poor waste management practices and insufficient water supply are significant factors that influence and facilitate the growth of pathogenic microorganisms which in turn leads to nosocomial infection. Brisibe et al., (2014) in a study in Port Harcourt, Nigeria the study affirmed that the aforementioned factors are negatively deteriorating the conditions of healthcare institutions.

CONCLUSION

Therefore, the study concluded that Pathogenic microorganisms are still deteriorating the condition of admitted patients in health institutions and that affects the optimism of patients concerning speedy recovery from their ailments, while healthcare workers also become victims of nosocomial infection due to lack of participation in conferences/seminars designed to nurture them on the recently discovered techniques/principles of infection prevention and control.

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