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Incidence of Blindness and Nystagmus in Children from Lahore Affected with Congenital Cataract

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ABSTRACT: *A retrospective study on Congenital Cataract (CC) was performed between October 2015 to May 2016 during ophthalmological consultation at different hospitals of Lahore. The aim of this research was to determine the incidence of lens extraction, nystagmus and blindness in congenital cataract patients in Lahore. The diagnosis of Congenital Cataract (CC) was done with the help of ophthalmologists by using visual acuity test, Snellen chart, ophthalmoscopy biomicroscopy and slit lamp examination. In this study, 180 congenital cataract patients were identified from 36000 patients with different eye anomalies and prevalence of CC was 5.0/1000 population. According to gender the incidence of CC was greater (n= 138) in males as compared to females (n= 42). The average age of incidence of CC patients was 7.5 years. The prevalence of blindness, lens extraction and nystagmus in these CC patients was about 15% (n=27), 42.8% (n=77) and 42.2% (n=76) respectively. People with CC are diagnosed late in life and therefore have difficulty in accepting the results caused by CC. This will be particularly valuable in providing awareness among affected individuals and let them know proper treatment of diseases which ultimate reduce the total burden of disease.*

Key words: *Blindness, Congenital Cataract, Lens Extraction, Nsytagmus, Predominance*

INTRODUCTION

"Eyes are most important to the soul". This previously well-established proverb focused on natural structure of eyes and its critical role in perception and visions (Qu, 2014). Proper functioning of human visual system depends on focusing of light by lens on retina. Any abnormality in lens construction and function leads to vision loss (Oles and Oles, 2012). World Health Organization (WHO) categorize vision loss as low vision (6/60≤VA< 6/18 100≤VF<200), severe vision impairment (3/60≤VA< 6/60

50≤VF<100) and profound vision impairment (VA< 3/60, VF<50). These are contemplated as authentic (Shah et al., 2011). Lens malformations especially Cataract is a major reason of impaired vision present in more than half of all cases worldwide (Ahmed et al., 2014).

The word Cataract is originated from a Greek word "kataraktes" meaning something that is rushing down. Cataract is characterized as Blurred, and non-transparent lens (Shiels and Hejtmancik, 2013). Due to cataract, visual deterioration is usually progressive and painless and do not show any typical features. The signs include blurry vision, fade color vision, poor night vision, and multiple image formation. The other factors such refractive index errors (43%), untreated congenital cataract (22%) also participates in visual loss or impairments in all over the world.

Overall due to cataract in 191 million individuals vision reduced, 10.8 million people became blind and 35.1 million were visually impaired (Khairallaah et al., 2015). In developing country of Pakistan predominance of blindness is 0.9% reported by the national visual impairment survey. Corneal scarring in cataract disease leads blindness with predominance of 29.4% and 11.8% in Northwest Ethiopia and Pakistan respectively (Asferaw et al., 2017). Heralded by the accomplishment of sequencing of the human genome, the last decade has seen an exponential rise in gene identification for many diseases.

Disorders associated with Congenital Cataract are quite common and there are more than 200 syndromes are reported for Cataract (Gillespie et al., 2014). Managing congenital cataract is considered as a great challenge and the most important part of managing CC is surgery. It is important that surgery must be performed soon in case of congenital visually significant cataract because it may lead to irreversible amblyopia if left untreated. The surgery timing is necessary as the effects on visual development and surgical risks should be balanced. The techniques for the management of pediatric cataracts, different methods for the calculation of intraocular lens (IOL) power and for the implantation of IOL have been developed and advanced steadily. Nystagmus can be stated as recurring, involuntary movement of eyes generated by slow drifts. It involves sinusoidal slow phase oscillations generally known as pendular nystagmus or alternating slow drifts commonly known as jerk nystagmus. The present study was conducted to find the occurrence of nystagmus, lens extraction and blindness associated with congenital cataract in Lahore, Pakistan. This will be particularly valuable in providing awareness relevant to the affected individuals and their families and let them know the proper diagnosis of the disease.

MATERIALS AND METHODS

Patients of Congenital Cataract

between the age group of ≤1-15 years old were examined by visiting different hospitals of Lahore (Mayo Hospital, Mughal Eye Hospital, Layton Rehmatullah Benevolent Trust Hospital, Services Hospital, Alehsan Hospital, Children Hospital and Ganga Ram Hospital). Performa's having information about the name, address, age, gender; nystagmus, visual acuity, lens extraction and disease status were distributed in unit of Congenital Cataract. The variables examined were age, gender, visual acuity including light perception, blindness, nystagmus and lens extraction.

Diagnosis of Congenital Cataract was done with the help of ophthalmologists by using visual acuity test and slit lamp examination. For patients too young who can't read Snellen's chart, they were analyzed by torch test and their response to light was analyzed. If they did not show any response they were considered blind. All this examination was performed by trained and experienced opthalmologists. Data was collected and compiled. Statistical analysis was done using chi-square test and was used for comparison between different age groups and was considered significant at $P \leq 0.05$.

RESULTS

In the study of 36000 cases with different eye ailments, 180 cases of Congenital Cataract were identified. Out of 180 cases, 76.67% (n=138) were male and 23.33% (n=42) were female affected with CC. In this study incidence of blindness, Lens extraction, and nystagmus was 15% (n=27), 42.8% (n=77) and 42.2% (n=76) respectively (Fig 1).

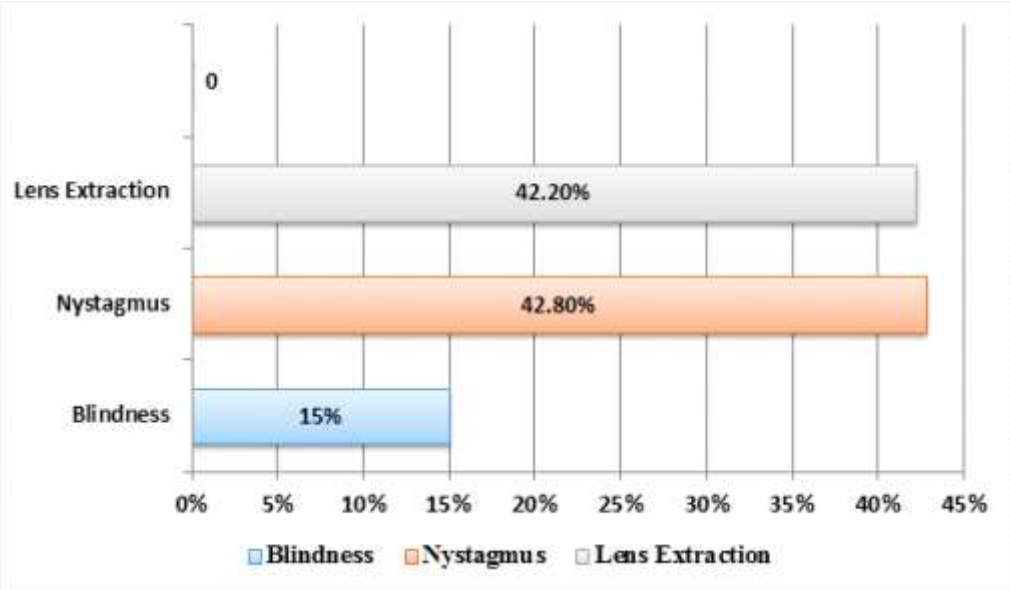

Fig. 1: Prevalence of Blindness, Nystagmus and Lens Extraction in Children with Congenital Cataract

There were total 42.8% (n=77) patients of lens extraction observed out of which the most significant age group was ≤1 year with 25.97% (n=20) patients having lens extraction and least cases were observed in age of 12-13 years with 2.60% (n=2) patients. In both men and women the prevalence of male patients was greater than females. Women accounted for 15.00% (n=18) cases of the study sample as compared to men 49.17% (n=59). The prevalence of Lens extraction according to age group is explained in Fig 2.

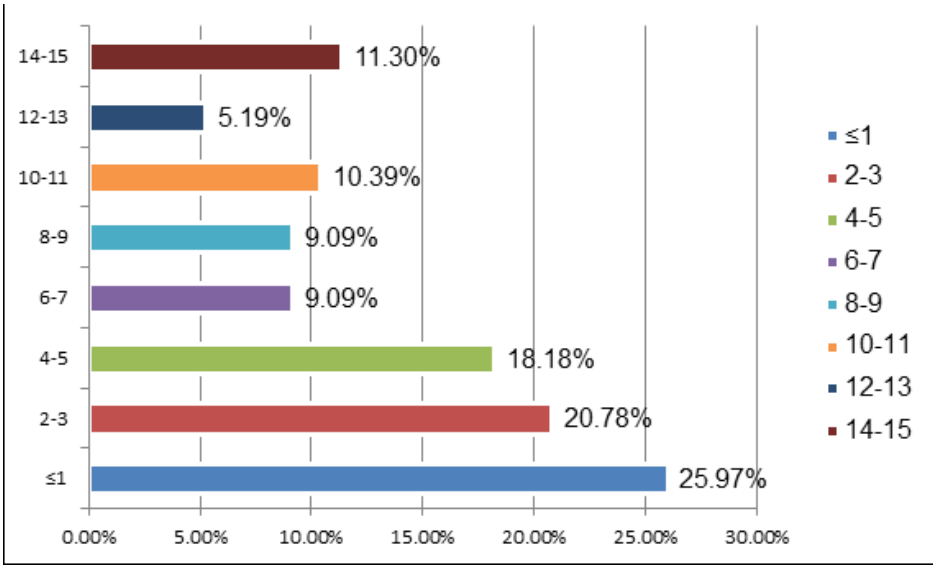

Fig. 2: Distribution of Lens Extraction in Patients of Congenital Cataract According to Age

In other part of this study out of 120 cases, 12.5% (n=15) patients having both lens extraction and blindness. In both men and women the prevalence of male patients 86.67% (n=13) was greater than females 13.33% (n=2). The most representative group of both lens extraction and blindness is 8-9 years with 26.67% (n=4) and no case was observed in 10-11 year age group. Three age groups ≤1, 2-3, 6-7,14-15 have same number of cases as 6.67% (n=1) while the age group 2-3 and 10-11 have prevalence about 20% (n=3). The remaining age group 6-7 has 13.33% (n=2) occurrence of both Nystagmus and lens extraction.

In cases of 42.2% (n=76) nystagmus most significant age was 4-5 years with 26.32% (n=20) having nystagmus. Three age groups (10-11, 12-13, 14-15) have same incidence of nystagmus 3.95% (n=3).The incidence of nystagmus according to age group is explained in Fig. 3.). In both men and women, the prevalence of male patients (48.33%) was greater than females (15.00%).

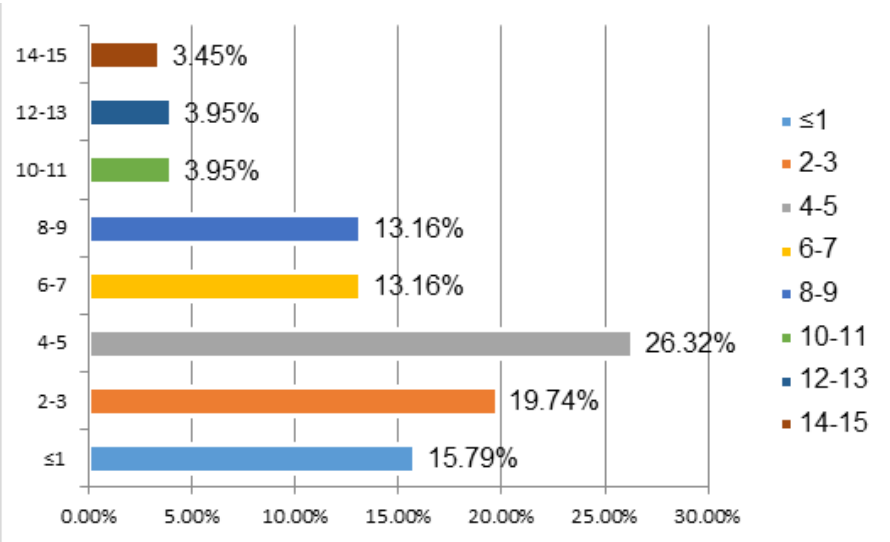

Fig. 3: Distribution of Nystagmus Patients of Congenital Cataract According to Age

Prevalence of blindness was 15% (n=27) out of which the most significant age was ≤ 1 year having 2.22% (n=6)patients of blindness and only one member (3.70%) of blindness was observed in two age groups (10-11, 14-15) The predominance of blindness according to age group is explained in Fig. 4. The incidence of blindness was observed more in males 60% (n=9) than females 40% (n=6).

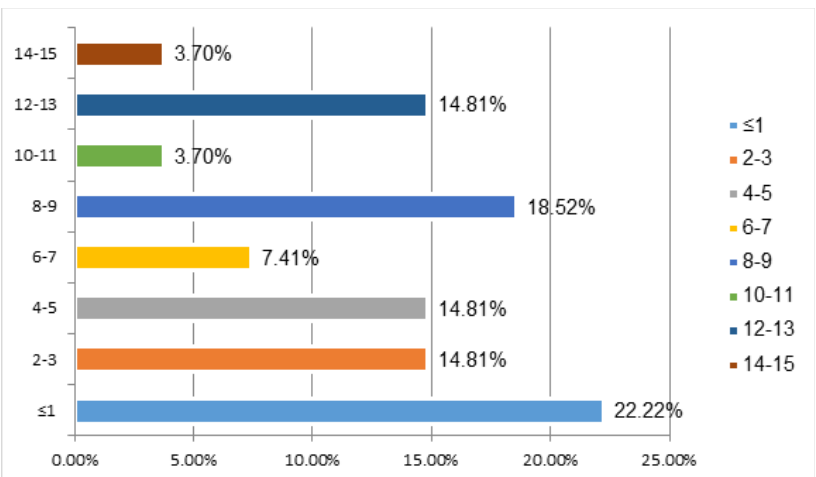

Fig. 4: Distribution of Blindness in Patients of Congenital Cataract According to Age

DISCUSSION

Human eye lens is most important part of eye that performs various functions. One of most significant role is to focus the light on to the retina, after that various photoreceptors detects the coming light. In our study the average age of CC patients was 7.5 years which are approximately similar to the enrolled with a range of the patient's age 1-3 years in India.

Visual outcomes are largely dependent on the timing of the surgery. Congenital and infantile cataracts, if not treated promptly, lead to profound and irreversible vision loss. Mostly reports preferred elder children treated with intra ocular lens (IOL) implantation while recent research reports concerned children for treated with IOL implantation. (Anna and Ulla, 2002). Visual outcomes are largely dependent on the timing of the surgery. Congenital and infantile cataracts, if not treated promptly, lead to profound and irreversible vision loss. Mostly reports preferred elder children treated with intra ocular lens (IOL) implantation while recent research reports concerned children for treated with IOL implantation (Anna and Ulla, 2002). Better visual outcomes are associated with surgery at an age of 3 to 15 months while normal visual acuity can be obtained by extraction at 6–8 weeks of age along with optical correction (Li et al., 2018) Mean age at the time of surgery is 21.7 ± 2.9 months (Ventura et al., 2013)

Similar gender biased pattern can be observed in other countries where two-third of cataract surgeries were done on boys (Nkumbe et al., 2011; Agarwal et al., 2010). In this study, the occurrence of disease in male patients was greater than females. Women accounted for 15.00% (n=18) cases of the study sample as compared to men 49.17% (n=59).

The term blindness and visual impairment are two different things, patients having blindness have no vision and patients with visual impairment have low vision. Overall 191 million visions reduced, 10.8 million people were blind and 35.1million were visually impaired due to Cataract (Khairallaah et al., 2015). Pakistan is a developing country and prevalence of blindness is 0.9% reported by the national visual impairment. In the world it was estimated that 38 million children were blind and a further 110 are visual impaired. In our study 23.33% of total CC patients were blind. The blindness cases in our study having more prevalence in age group of 2-3 years and more common in male patients with incidence of 17.5% and prevalence was 2.8/100(≤1-15). In contrast prevalence of blindness per 1000 children according to age in developed countries such as Bangladesh 1.09(0-5), Nepal 0.63(0-14), Malawi 1.1(0-5) and Gambia (0-19) were diagnosed (Wilson et al., 2003).

Person with nystagmus may experience reduced visual acuity. 63.3% of total CC patients had nystagmus in our study. In nystagmus,

eyes make repetitive and involuntary movements which result in less vision.

CONCLUSION

Congenital cataract is more prevalent in males as compared to females and average age of prevalence of CC was ≤1-5. This study will help to reduce the total burden of disease by spreading awareness among affected as well as other individuals and let them know proper treatment of diseases. We also helped some patients in cataract surgery by giving help in consulting with different eye surgeons.

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Seroprevalence of Hepatitis B Virus Among Sex Workers and General Population in Bahawalpur

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ABSTRACT: *Hepatitis B is a life-threatening disease of liver caused by Hepatitis B Virus (HBV). It is considered as a serious global risk infecting 25.7crores (257 million) people around the globe. This virus (HBV) is responsible for causing deaths of 887000 people in the world due to Hepatocellular carcinoma and cirrhosis. Keeping this in view, the study was designed to investigate the seroprevalence of HBV along its various risk factors in sex workers of Bahawalpur City. Present study was conducted in district hospital of the Bahawalpur city from year 2016 to 2017. Samples (n = 9370) from general population were randomly collected from different geographical areas of city. Convenience samples of 33 female sex workers were collected to check the incidence in sex workers. Initially, samples were screened by ICT and confirmed by direct ELISA and PCR. Out of 9370 samples 224 (2.39%) were found positive with HBV. PCR identification using PR2a primers reveled that out of 224, 148 were seriously infected and were recommended for immediate medication. Out of these 33 females sex workers 22 were found infected, with high prevalence of about 66.67%. Foremost reasons for transmission of virus were probably blood transfusions, piercing, unsafe sexual intercourse and poor hygiene conditions due to unawareness and low literacy rate. Further planning to control the dissemination of HBV infection includes mass level screening followed by awareness campaigns& workshops for the enhancement and betterment of livelihood principles and hygiene of locals.*

Keywords: *Rectal douching, sexual transmission, low literacy rate, hygiene conditions.*

INTRODUCTION

Pakistan is developing country with high prevalence of hepatitis B & C viruses. The country is highly endemic for different diseases including hepatitis with 7-9 million people living with hepatitis B virus (Ali et al., 2011). Bahawalpur is under developed city of south Punjab with low resources for

health sector. The literacy rate of the city is also very low. The people of the city are not well aware of the disease and how it transmits (Khan, 2010).

The disease is caused by HBV which is a double stranded DNA virus belonging to family Hepadnaviridae with Orthohepadnavirus genus having small circular genome of 3.2 kb size (Tiollais and Buendia, 1991). Hepatitis is the inflammation of liver and is caused by different types Hepatitis viruses. Liver being an imperative organ performs multiple tasks like nutrient processing, blood filtration and fights against infections. These functions are affected by intense alcohol consumption, toxins, medication and some clinical disorders (Lucey et al., 2008). Hepatitis A, B, C &E are more prevalent in Pakistan. HAV and HEV infection are acute in nature and reported in outbreaks as both has same route of transmission (fecal oral route). They are also known as self- limiting viruses and body swiftly cures itself (Yayli et al., 2002). HBV & HCV are chronic in nature and leads to carcinoma formation if untreated or if infection persists for long time. Acute Hepatitis B, being solemn viral infection of liver is short term disorder of about 6 months while persistent (chronic) Hepatitis B is lifelong infection (WHO, 2018).

About 2 billion people are exposed to this virus and 357 million people are chronically infected every year and it is reported as global health problem (Jefferies et al., 2018). In humans HBV infection occurs due to mutant genotypes, immune suppression and interaction of HBV with host (Oakes, 2014). HBV is transmitted from person to person through blood transfusion, semen and other body fluids. It can transfer from infected mother to offspring during pregnancy or at the time of birth (Greenfield et al., 1986). Intravenous drug users are at higher risk due needle/syringe sharing with other individuals (Samuel et al., 2001). Rarely It often spread in the form of outbreaks due to congested community, poor sanitation and poor infection control by heath centers (Control and Prevention, 2001). Body piercing and tattooing are also the causes of virus spreading. Intercourse with positive spouses can spread HBV, especially in adolescents and immature adults (Akhtar et al., 2018).

Female sex workers at high risk of getting disease due to multiple partners. Oral-anal intercourse, anal-genital intercourse (Rosenblum, 1992) and rectal douching were considerably associated with transmission of HBV(Control et al, 2018). While no confirmation of HBV transmission through oral-oral and oral-genital contact (Judson, 1981). Intravenous drug users (IVDU) are at higher risk of getting HBV infection due to needle sharing. Human Immuno Deficiency virus (HIV) infection in IVDUs facilitates HBV infection and show adverse immunological effect of HB vaccine (Piot and Goilav, 1990).

Mother -to-infant transmission of HBV contributes notably to the higher number of HBV cases in newborns due to highly weak immune status (Han et

al., 2011). The risk of developing chronic infection is about 90% in infants while maximum of 5% in adults (Wiseman et al., 2009). In United States in 2008, HBV infection due to sexual intercourse in female were 7025 and 11900 in males making approximately 50% of total cases with 622 females and 825 males, were aged between 15-24 years old (Satterwhite et al., 2013). Barber shavings are also considerable cause of disease transmission throughout community due to sharing of blades, scissors etc (Khaliq and Smego, 2008).

This research was conducted to check the frequency of HBV infections in Bahawalpur, Pakistan. For this purpose, hospital records were used as a basis of secondary data. Records of year 2017 from January to December were studied for comparative prevalence of HBV & HCV.

MATERIALS AND METHODS

Sampling

During the year 2016-17, samples were collected randomly from patients who visited District Head Quarter Hospital. Sample size (n) was of 9370 people. Convenience sampling technique was used to collect samples (n=33) from female sex workers.

Sample Processing and Techniques

9370 blood samples from general population and 33 blood samples from sex workers were collected in sterile blood collecting tubes and stored at room temperature for 15-30 minutes for extraction of serum. This serum was further used along with buffer for screening through ICTs kits that were manufactured by Bio Check. Manufacturer's instructions and prescribed protocols were strictly followed.

The positive samples were further processed by ELISA. HBV competition Ab test based on competition between serum to be tested with monoclonal antibody fixed in ELISA plate. For this purpose, Human HbsAg (hepatitis B virus Surface Antigen) ELISA Kit manufactured by Wuhan Fine Biotech Co., Ltd under cat# EH4002 were used as per instructions mentioned by manufacturer.

ELISA positive samples were subjected to PCR because it is considered as the most sensitive and specific gold standard tool for diagnostic purposes. HBV PR 2a primers were used in Polygenetic analysis using serum sample. With an annealing temperature of 50ºC, the sequence of both forward and reverse primers is mentioned as,

Primer	Sequencing	Position(nt)
2300 F	CCACMWAATGCCCCTATC	2300-2317
215 R	AGRAAMACMCCGCCTGT	215-200

RESULTS

Prevalence of HBV was studied using hospital records of year 2016-17 of District Headquarter Hospital, Bahawalpur. It was found that disease is quite prevalent in different areas of city. About 9370 persons were screened for HBV using ICT kits. Table 1 illustrates the results of ICT screening. The positive samples from ICT were subjected to ELISA, out of 224 samples 181 were found having high titer. For further conformation, PCR was performed for positive samples. Out of 181 samples, 148 were found positive with high number of viral copies. Table 2 presents the results of ELISA along with PCR. Samples from 33 female sex workers were taken and screened for HBV. Out of 33 samples, 22 were found positive for HBV. Figure 1illustrates the data about Female sex workers.

Table 1: Screening Results of HBV in Year 2016-17

Months (2017)	Total screened persons	**HBV +ve**	Prevalence of HBV
January	735	**9**	1.22%
February	695	**14**	2.014%
March	469	**13**	2.77%
April	881	**13**	1.47%
May	882	**4**	0.453%
June	583	**9**	1.54%
July	1013	**26**	2.56%
August	1134	**30**	2.64%
September	959	**26**	2.71%
October	842	**32**	3.80%
November	325	**19**	5.84%
December	852	**29**	3.40%
Total	**9370**	**224**	**2.39%**

Prevalence = no. of cases/ diagnosed population×100
Prevalence = 224/9370×100
Prevalence = 2.39%

Table 2: Screening Results of ELISA and PCR

Categories	**Total samples**	**Positive results**	**Negative results**
ELISA	224	181	43
PCR	181	148	32

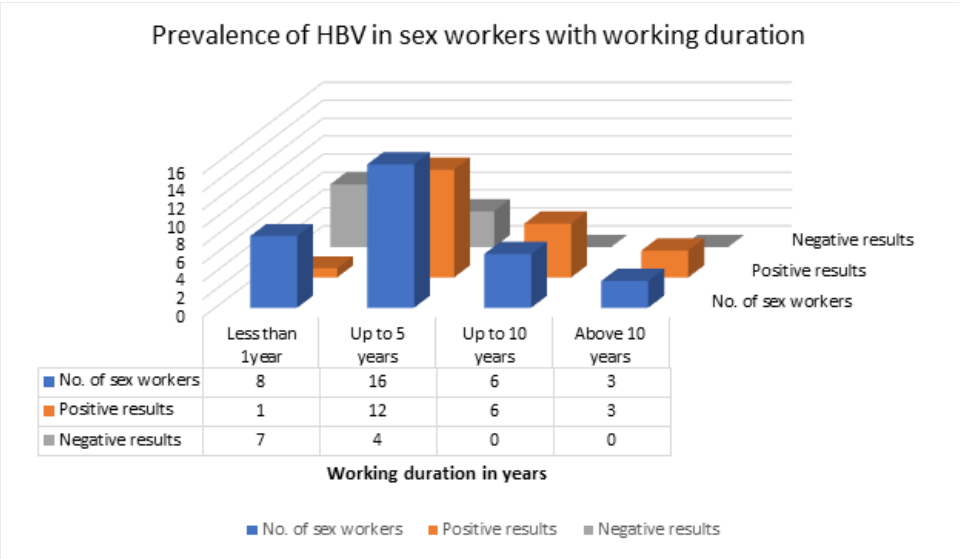

Fig. 1: Data of Female Sex Workers, Their Work Duration & HBV status

Total screened individuals = 33
Positive individuals = 22
Expected prevalence = 22/33 ×100
=66.67% (only in female sex workers)

DISCUSSION

Pakistan is under developing country and is in endemic zone for HBV. This study showed that HBV infections are very prevailing with prevalence of about 2.39% in the city. The virus is blood-borne and spreads through different routes (Greenfield et al., 1986). Intravenous drug users are at higher risk due to needle/syringe sharing with other individuals (Bialek et al., 2005). Body piercing and tattooing are also the cause of virus spreading (Braithwaite and Stephens, 1999). Intercourse with positive spouses can spread HBV, especially in adolescents and immature adults (Fattovich and Bortolotti, 2008). Mother-to-infant transmission of HBV contributes notably to the higher number of HBV cases in newborns due to highly weak immune status (Wiseman et al., 2009). It rarely spread in the form of outbreaks due to congested community, poor sanitation and poor infection control by heath care centers. Investigation about the transmission of virus through barbers showed positive results. There were no sterilizers or antiseptics (Candan and Alagözlü, 2002)

The next thing to be investigated was the spread of HBV infections by means of sexual contact with HBV +ve sex workers (Rai et al., 2007). For this, basic screening was performed to check the health status of sex workers regarding HBV infection.

Only 33 females agreed to go through screening process. 22 out of 33 were found HBV +ve. Investigation revealed that no safety measures are adopted while having sex. Due to this they were found responsible for spreading of disease especially in teenagers in city.

Our study correlates with a research study conduct in Nigeria that showed similar kind of results. Relative HBV prevalence among sex workers in Nigeria is a sign that active sexual dissemination has significant impact in the spread of virus. Sex workers act as pool of a reservoir group for the maintenance and transmission of the virus as they are sexually active and has multiple partners (Forbi, 2008). Dissemination by means of anal sex was also reported (Rosenblum, 1992). This also relates with a similar study with similar results that was conducted in Mexico on pregnant women whose spouse were HBV positive (Vázquez-Martínez, 2003).

In developed western countries, a study revealed that HBV infection rate is about 20-27% more in spouses of hepatitis B patients, female sex workers and sexually active multi-partner young adults as compared to "controls"(Judson, 1981). In United States, a study showed that out of 3816 examined homosexual men, 6.1% had HBsAg, 52.4% had antibodies to HBsAg and 3.0% had anti-HBc (no indication of HBV infection at start of study) (Schreeder et al., 1982).

Our study is useful in designing public health programs for the control of HBV in Bahawalpur. We call for innovative and immediate implementation of best possible ways to control such dissemination patterns.

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Phytochemical Composition of Ginger, its Nutritional and Pharmacological Importance

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ABSTRACT: *Current studies were performed to evaluate the phytochemical, nutritional and pharmacological importance of Zingiber officinale (ginger). Z. officinale contains γ-cadinene (2.13%), α-curcumen (8.11%), α-fernesene (8.22%), 2, 6, 10-dodecatrien-1-ol (8.29%), β-seiquphellandrene (11.80%), α-gingiberene (15.32%). Ginger is cultivated worldwide due to its general usage as a spice in food. It is rich in nutritional contents especially carbohydrates, crude protein, lipid, crude fat 5.03±0.43 and crude fiber so it plays a good role in human health. It also contains trace amounts of minerals such as 0.20±0.01 mg/100 mercury, 0.070±0.02 mg/100 nickel, 0.50±0.01 mg/100 lead, 3.70±0.08 mg/100 cadmium, 15.50±0.09 mg/100 chromium, 28.20±0.11 mg/100 manganese, 21.60±0.12 mg/100 zinc, 25.10±0.13 mg/100 copper, 26.60±0.11 mg/100 iron, 31.20±0.15mg/100 sodium and 47.60±0.17 mg/100 calcium. Z. officinale also finds numerous medicinal applications and is used as anti-viral, anti-oxidant, anti-bacterial, anti-anthelmintic and anti-diabetic agent.*

Key words: *Zingiber officinale; Ginger; Phytochemicals; Nutritional; Pharmacological*

INTRODUCTION

Zingiber officinale is a perennial plant and belongs to ginger family and is cosmopolitan throughout the tropical and semitropical regions of Asia. Its rhizome (Fig. 1), commonly known as ginger, has a pungent flavor but it has been used as a spice since 2000 years (Altman and Marcussen, 2001; Shukla and Singh, 2007).

Fig. 1: Rhizome of ginger (Kumar et al., 2011)

Ginger is commonly known as Adrak (Urdu), Ginger (English), Adarakha (Hindi), Sheng jiang (Chinese), Aduwa/sutho (Nepali), Gemeiner (German), Shokyo (Japanese), Gingembre (French) and Ada (Bengali) (Kumar et al., 2011). *Z. officinaleis* is used as a common spice and is rich in micro- and macronutrients which have a good role in human health. Ginger contains a variety of minerals like iron, magnesium, calcium, zinc and copper. These components are necessary for various physiological mechanisms in living organisms and have always been recognized as essential components (Liang et al., 2004; Somers, 1974). Its rhizome finds extensive medicinal applications and has been administrated both for communicable as well as non-communicable diseases. Ginger has ability to revitalize the body in disease conditions by re-boosting weakened physiological functions of the human body and increasing immunity as well as appetite. It's some active ingredients including zerumbone, zingerole, 6-paradol, 6-shogaol and 6-gingerol have the potential of balancing circulation and upgrading enzyme actions (Dissanayake et al., 2020).

Ginger is a major ingredient of herbal medicines which are used for the treatment of toothache, asthma, stroke, rheumatism, constipation cataract, nervous diseases, gingivitis and diabetes in Chinese, Ayurvedic and Tibbe-Unani (Tapsell et al., 2006; Wang and Wang, 2005). Keeping in view the common uses of *Zingiber officinale* in diet, current studies were performed to review its phytochemical composition, nutritional and medicinal importance.

METHODOLOGY

Studies were conducted to investigate the chemical composition of *Zingiber officinale,* its nutritional and pharmacological potential. Relevant literature has been reviewed regarding the physicochemical composition (Ali et al., 2008; Belewu et al., 2009; Bhargava et al., 2012; Ekwenye and Elegalam, 2005; Eleazu et al., 2012; Osabor et al., 2016; Rahmani, 2014; Sasidharan and Menon, 2010; Srivastava and Mustafa, 1992), nutritional importance (Akindahunsi and Salawu, 2005; Hassan and Umar, 2006; Horwitz, 2010; Hussain et al., 2010; Ladan et al., 1996; Nwinuka et al., 2005; Odebunmi et al., 2010; Okaka and Okaka, 2001; Osabor et al., 2016; Prakash, 2010; Umoh et al., 2014) and medicinal value (Al-Amin et al., 2006; Ali et al., 2008; Bartels et al., 2015; Bordia et al., 1997; Ghayur et al., 2005; Kshirsagar and Singh, 2001; Lantz et al., 2007; Mascolo et al., 1989; Mishra et al.,

2012; Ojewole, 2006; Shahrajabian et al., 2019; Srivastava and Mustafa, 1992; Yang et al., 2009; Yassen and Ibrahim, 2016; Young et al., 2005). The antiviral (Denyer et al., 1994), antifungal (Ramkissoon et al., 2012), anthelmintic (Iqbal et al., 2001) and anti-diabetic (Akhani et al., 2004; Choi and Kim, 2007; Eyo et al., 2011; Ojewole, 2006; Singh et al., 2009; Singh et al., 2018; Yamahara et al., 1989) studies of the ginger have also been reviewed.

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DISCUSSION

Phytochemical Composition

Phytochemicals include all the chemical compounds that occur naturally in plants. They contribute to the colour, flavor and smell of plants. They also owe to plant's natural defense system against diseases (Eleazu et al., 2012). Ginger contains many macromolecules like lipids and carbohydrates and also minerals, vitamins and trace nutrients (Belewu et al., 2009). Ginger contains 31 compounds; there are also reports for the existence of 51 compounds in organically grown fresh ginger. These components include gingerols, paradols, dihydroparadols, gingerdiols, 1-dehydrogingerdiones, acetyl derivatives of gingerols, shogaols, [3]-dihydroshogaols, di- and mono-acetyl derivatives of gingerdiols, zingiberene, diarylheptanoids, phellandrene methyl ether derivatives, etc. The presence of [6]-gingerol, [4]- gingerol, [7]-gingerol, [8]- gingerol and [10]-gingerol was also reported. The chemical structures of important constituents (8-Gingerol, 6-shogaol, 6-gingerol, 10-gengerol, paradols, zingerone, zingiberene, phellandrene present in ginger) are given in Figure 1 (Ali et al., 2008).

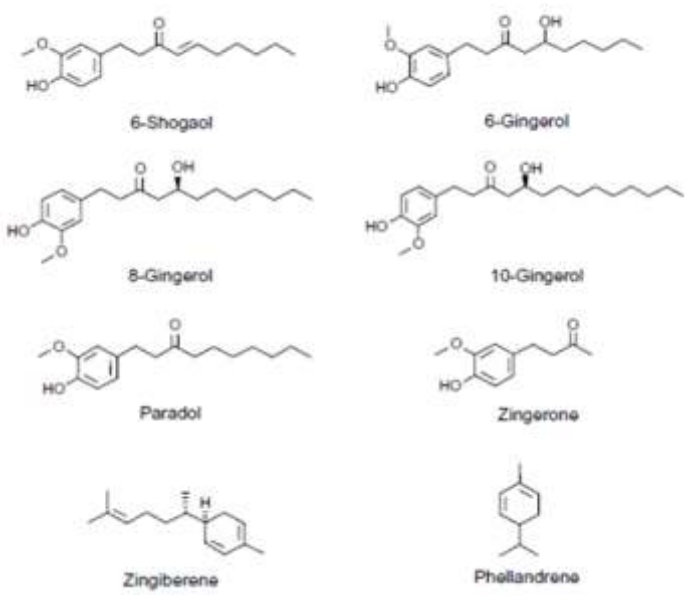

Fig. 2: Chemical structures of some bioactive components of ginger

The aqueous and petroleum ether extracts of *Z. officinale* share many common ingredients including reducing sugars, cardiac glycosides, polyphenols, flavonoids, saponins and alkaloids while anthraquinones, hydroxyl anthraquinones, anthranoids, phlobatannins and tannins were absent in both the extracts (Osabor et al., 2016). Gingerols (homologous series of phenolic compounds) are responsible for the pungency of fresh ginger; [6]-gingerol is the most abundant ingredient. In dried ginger, the pungency is mainly owed to the occurrence of shogaols (dehydrated gingerols) e.g., (6)-shogaol (Ali et al., 2008; Srivastava and Mustafa, 1992).

Phytochemical screening has shown the occurrence of tannins, phlobotannins, terpenoids, saponins, flavonoids and alkaloids in Z. officinale extracts (Bhargava et al., 2012). The soxhlet apparatus was used to obtain the extracts of Z. officinale whereas GC and GC-MS analyses were used to find the chemical profile. The analyses have shown the presence of thirty-two compounds in ethanolic extracts and forty compounds in methanolic extracts. The methanolic extract contains ?-cadinene (2.13%), ?-curcumen (8.11%), ?-fernesene (8.22%), 2,6,10-dodecatrien-1-ol (8.29%), ?-seiquphellandrene (11.80%), ?-gingiberene (15.32%) and many more (Bhargava et al., 2012; Sasidharan and Menon, 2010). Table 1 shows the chemical compounds obtained from 100% ethanolic extract of *Z. officinate.*

Table 1: The Chemical Ingredients Present in 100% Ethanolic Extract of Z. Officinate (Ginger roots) (Bhargava et al., 2012; Sasidharan and Menon, 2010)

Sr. No	RT	Area%	Name	Molecular formula
1	7.434	1.06	Cineole	$C_{10}H_{18}O$
2	9.408	0.68	Camphol	$C_{10}H_{18}O$
3	12.364	0.23	Cycloisosativene	$C_{15}H_{24}$
4	13.434	0.35	Beta Fernesene	$C_{15}H_{24}$
5	13.634	0.27	2,6,10- Dodecantrien-1-ol	$C_{15}H_{26}O$
6	14.042	11.27		$C_{15}H_{22}$
7	14.274	20.57	α-Gingiberene	$C_{15}H_{24}$
8	14.352	9.77	α-Fernesene	$C_{15}H_{24}$
9	14.531	10.61	Cyclo Hexane	$C_{15}H_{24}$
10	14.650	3.41	ϒ- Cadinene	$C_{15}H_{24}$
11	14.872	12.71	β-Seiquphellandrene	$C_{15}H_{24}$
12	15.050	1.15	α- Panosinsen	$C_{15}H_{24}$
13	15.509	1.09	Nerolidol B	$C_{15}H_{26}O$
14	16.932	O.74	Guaiol	$C_{15}H_{26}O$
15	17.050	0.27	Naphthalene	$C_{15}H_{24}$
16	17.403	0.79	Rosifaliol	$C_{15}H_{26}O$
17	17.482	1.24	β-bisabolol	$C_{15}H_{26}O$

Ginger is an herbal medicinal product that shares its many characteristics with non-steroidal anti-inflammatory drugs. Ginger prevents the formation of free radicals as it behaves as a strong anti-oxidant. There are no side effects of using ginger as a herbal medicine (Bhargava et al., 2012; Sasidharan and Menon, 2010). Table 2 displays some important active components of ginger, along with their respective biological activities (Rahmani, 2014).

Table 2: Active Biological Compound of Ginger (Rahmani, 2014)

Active compound of ginger	**Biological Potential**
Gingerol and gingerol related compounds	Modulation of genetic and other biological activit ies; Anti-tumor, anti-inflammatory, anti-analgesic, anti-microbial, antioxidant activity
Paradol	Anti-cancerous, anti-oxidant and anti-microbial activity
Shogaol	Anti-inflammatory and anti -oxidant activity; 6- shogaol displays anti-invasion, anti-proliferation and anticancer activities
1-Dehydro-(10) gingerdione	Anti-inflammatory; genes regulation
Terpenoids	By activation of p53, it induces apoptosis
Zingerone	Anti-bacterial, anti-inflammatory and antioxidant potential
Ginger flavonoids	Antioxidant potential
Zerumbone	Anti-tumor and anti-microbial activity

Nutritional Importance

Ginger is a widely used medicinal plant but it has also finds some nutritional importance. It contains minerals which are important for human body; it is also comprised of starch and little amount of energy containing compounds. However, it is majorly used as a spice in different countries. It is not used as a major food product because it contains only minerals and some other organic/inorganic compounds which provide only very small amount of energy; however, they may act as antioxidants or against various diseases (Prakash, 2010). Ginger is comprised of moisture, ash, fiber, fat, proteins and available carbohydrates. Table 3 shows the proximate composition (%) and mineral elements (mg/100gDM) of rhizome of *Zingiber officinale* (Hussain et al., 2010; Nwinuka et al., 2005; Odebunmi et al., 2010).

Table 3: Proximate Composition (%) and Mineral Elements (mg/100gDM) of rhizome of *Zingiber officinale*

Proximate composition (%)		Mineral elements (mg/100gDM)	
Constituents	Composition	Mineral elements	Composition
		Mercury	0.20±0.01
		Nickel	0.070±0.02
Moisture		Lead	0.50±0.01
Carbohydrate		Cadmium	3.70±0.08
Crude protein		Chromium	15.50±0.09
Lipid		Manganese	28.20±0.11
Ash		Zinc	21.60±0.12
Crude fiber		Copper	25.10±0.13
Ascorbic acid		Iron	26.60±0.11
Crude fat		Sodium	31.20±0.15
		Calcium	47.60±0.17

The moisture of the *Z. officinale* (28.20±042%) lies on the top as compared to that of some common Nigerian rhizomes like Alpine rhizomes (640±0.15%) (Ladan et al., 1996). The ash content of *Z. officinale* rhizome was found to be 4.20±0.11%DM. The ash content is a sign of the entire inorganic mineral content. Earlier investigations suggest that the rhizomes of *Z. officinale* have low mineral components (Horwitz, 2010; Ladan et al., 1996). However, some reports suggest that ginger is a good source of energy. The presence of high quantity of sugar (carbohydrates) in ginger rhizome plays a big role in human health, in addition to the energy supply; sugar is also required in various organic reactions that don't seem to be directly involved with energy metabolism. Phytochemical screening has shown the presence of numerous glycosides in the water extract (WE) of common ginger rhizome. Cardiac glycosides have a nice worth especially in gut; they help to support its strength and rate of contraction when it suffers from failing. Alkaloids were detected within the water extract of common ginger rhizome. Alkaloids show important physiological effects on humans and different animals. They also have a role in human health e.g., analgesic and they may be used as a powerful narcotic for the relief of pain (Akindahunsi and Salawu, 2005).

The mineral element composition (Table 2) revealed that Zingiber officinale rhizome has good levels of iron, sodium, copper, zinc, metal and low levels of chromium, cadmium, nickel and mercury. Iron is needed for the formation of blood cells and its deficiency causes anemia (Umoh et al., 2014). However, the iron content (26.6 mg/100g) was low as compared to that actually needed (4.50 g) within the body. Manganese is a necessary chemical element in higher animals; it participates in the action of the many enzymes, its deficiency causes testicular atrophy. Higher levels of this mineral component in plants and animal have cyanogenic effects (Okaka and Okaka, 2001). Zn is an essential trace element within the in the human body; it is present in high levels within the red blood cells as an essential part of carboniferous anhydrate (an enzyme) that promotes several reactions with reference to carbon dioxide metabolism. In pancreas, Zn helps in the storage of insulin. In plants, it helps in the management of diabetes (Okaka and Okaka, 2001). The sodium content in ginger rhizome was found to be considerably low (31.20±0.15 mg/100 g). This can be another advantage since high Na level is involved in rise of blood pressure (Osabor et al., 2016).

Medicinal Value

Ginger is a medicinal plant and has been commonly used in Tibb-Unani, Ayurvedic and Chinese herbal medicines. It is used for the treatment of helminthiasis, infectious diseases, fever, dementia, hypertension, vomiting, indigestion, constipation, cramps, sore throats, pains, muscular aches, sprains, rheumatism and arthritis (Ali et al., 2008). It has been used in ancient Chinese drugs to treat colds, nausea and headache; it was also used

for the treatment of muscular discomfort and rheumatic disorders in Ayurvedic and Western practices (Yang et al., 2009). Ginger and its isolated ingredients exhibit anti-oxidant, anti-emetic, anti-lipidemic, anti-hyperglycemic, anti-apoptotic, anti-inflammatory, anti-tumorigenic and immuno-modulatory activities. Ginger shows insignificant adverse/side effects and is regarded as a safe herbal medicine (Ali et al., 2008).

Ginger rhizome contains volatile phytochemical components; rhizome is mainly composed of zingiberene whose derivatives are used to treat pains, nausea, vomiting, asthma, cough and inflammation; it also has been found anti-pyretic (Mishra et al., 2012), hypoglycaemic, anti-inflammatory, analgesic (Ojewole, 2006; Young et al., 2005), antiemetic, anti-ulcer (Mascolo et al., 1989), anti-hypertensive, cardio tonic (Ghayur et al., 2005), anti-platelet aggregation (Bordia et al., 1997) and hypolipidemic (Al-Amin et al., 2006). Moreover, there are lots of investigations which proved their advantageous effects against numerous diseases where they act as neuronal, anodyne, anti-bacterial, anti-inflammatory, anti-tumour and anti-fungal agents (Yassen and Ibrahim, 2016). Anti-inflammatory potential of a various ginger extracts and its compounds has been reported; its effectiveness level is determined by the length of the side chains (Bartels et al., 2015). However, inflammatory potential is increased by using a combination of ginger extracts as compared to an individual compound (Lantz et al., 2007). Ginger has its specific ability to retain its active ingredients even in its volatile oils (Shahrajabian et al., 2019). Major phytochemicals of ginger root include starch, oleoresins, bisabolene, zingibain, gingerols, essential oils (zingiberne, zingiberole, camphen, cineole, borneol), proteins and mucilage that are accounted for the healthful properties of ginger. Ginger is used in treatment of numerous diseases. Phytotherapy (herbal medication or Herbalism) is that the study of plant science and it involves plants which are supposed to possess healthful functions or/and have the ability to provide diet supplements. Plants have been remained important for medical treatment throughout most of the human history. The World Health Organization (WHO) is trying to promote the movement for "Saving plants for Saving Lives" (Kshirsagar and Singh, 2001).

Ameliorative effects have been reported with the consumption of ginger in musculoskeletal disorders and arthritis. The use of ginger results in significant relief in pain without causing any adverse effects in the said diseases. The bioactive components in ginger act as dual inhibitors of lipoxygenase and and cyclooxygenase pathways (Srivastava and Mustafa, 1992).

Antiviral Activity

Among the various viruses that cause the respiratory diseases, picornavirus is one. The dried rootstalk

of ginger possesses anti-rhino-viral potential. Fractionation by solvent extraction, solvent partition and radio-controlled by bioassay, allows the isolation of many sesquiterpenes with anti-rhino-viral activity; the foremost activity was displayed by ?-sesquiphellandrene (Denyer et al., 1994).

Antifungal Activity

Extract of ginger powder is effective against several antifungal diseases. The principle antifungals in the ginger are the gingerols and gingerdiol (Ramkissoon et al., 2012).

Anthelmintic Activity

The stem extract (e.g., in methanol) of Z. officinale was tested for antihelmintic activity against the earthworm Pheretima posthuma. The tested extract (100mg/ml) has shown significant antihelmintic activity. It was found that Z. officinale had the ability to kill the test worms (100%) within 2 hours of exposure (Iqbal et al., 2001).

Anti-diabetic Activity

Diabetes is a crucial health problem all over the world. It is a chronic condition and caused by abnormality of carbohydrates metabolism. The major cause of diabetes is insensitivity of target organ for Insulin or low blood insulin (Singh et al., 2018). Severe tissue and vascular damages occur if diabetes remains untreated; the diseases results in serious complications such as cardiovascular, retinopathy, nephropathy, neuropathy and ulceration complications (Ojewole, 2006). Earlier studies reported that ginger juice significantly lowers the blood glucose in diabetic and non-diabetic animals (Eyo et al., 2011). In the presence of 30mM 2-deoxy-D-ribose and 0.11M- 6GN, the growth of osteoblastic Mc3T3 -E1 cells was raised, due to rise in osteocalcin secretion, collagen content and the alkaline phosphatase activity. The 1 and 100 nM concentrations of 6-GN have been found to increase the osteoprotegerin secretion in osteoblastic cells and decreases the protein carbonyl contents of osteoblastic cells, which is important in bone diseases related to diabetes (Choi and Kim, 2007). The antidiabetic activity of fresh juice of Z. officinale was suggested to proceed through 5-HT receptor antagonism. 6-gingerol (the biological and chemical marker substance of Z. officinale) is reported to have 5-HT antagonistic activity (Yamahara et al., 1989). It was shown that gingerol when present in large amount, can increase cell-mediated glucose uptake via increasing insulin-sensitivity, thus causing improvement in diabetes disease (Akhani et al., 2004). The main constituent 6-gingerol also reveals antioxidant potential, hypoglycemic property and lipid lowering in order to treat type 2 diabetes (Singh et al., 2009).

CONCLUSION

Z. officinale is rich in nutritional nutrients (carbohydrates, crude protein, lipid, crude fat, crude

fiber and minerals). It also contains ϒ-Cadinene (2.13%), α-Curcumen (8.11%), α-Fernesene (8.22%), 2,6,10-dodecatrien-1-ol (8.29%), β-Seiquphellandrene (11.80%), α-Gingiberene (15.32%) and many more. It also contains minerals in trace amounts such as mercury, nickel, lead, cadmium, chromium, manganese, zinc, copper, iron, sodium and calcium. Z. officinale is not a major food product; however, it is a commonly used spice and finds applications in food, cosmetics and pharmaceutical field. It also finds a medicinal value and is used as anti-viral, anti-oxidant, anti-bacterial, anti-anthelmintic and anti-diabetic agent.

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Association of Depression and Eating Disorders Among University Students in Lahore

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ABSTRACT: *Adolescence and young adulthood are the most susceptible age groups for developing eating disorders and depression, for both males and females. In this research, we aimed to study the association of depression and eating disorders in students from different universities of Lahore. It was a quantitative and cross-sectional design and the sample constituted of 327 university students of 17 to 25 years of age. Participants were selected through convenience sampling. Instruments 'Eating Attitudes Test-26' (EAT-26) and 'Center of Epidemiologic Studies Short Depression Scale-10' (CESD-10) were applied to assess presence of depression and eating disorders. A score of 20 and above on EAT-26 was considered a cut-off to determine susceptibility to eating disorders, whereas 10 or more on CESD-10 was the indicators for higher risk for depression. Descriptive statistics (mean, standard deviation, frequency and percentage) were calculated for all continuous and categorical variables. Chi square and odds ratio were applied to assess association between depression and eating disorders. The study participants had higher prevalence of depression than eating disorders (58.3% and 37% respectively). The risk of eating disorders was higher in depressed individuals, especially in young females (21 years old and younger), who also had higher susceptibility towards both depression and eating disorders. Individuals belonging to middle-income families and those who paid rent were more depressed. Significant association was seen between being a day-scholar and higher risks of eating disorders. Although, results revealed that association between eating disorders and depression were not significant (p=0.226), but depressed participants had higher chances of having eating disorders.*

Keywords: *Depression, eating disorders, universities, students, middle income, risk*

INTRODUCTION

Universally eating disorders (EDs) have been reported to affect majority of the adolescents, in which the larger percentage is that of girls and young females (Kavas, 2007; Costarelli et al., 2010; Shaikh and Kayani, 2014; Ozenoglu et al., 2015). In Western nations disordered eating has been reported to affect 9-22% of females (Costarelli et al., 2010).

Recent studies show that around the world, one-half of the population is at an increased risk of eating disorders, most likely in the age groups adolescence or early adulthood in both males and females (Kavas, 2007). Negativity, negative body image, decreased self-esteem, neuroticism, spontaneity, perfectionism, anxiety, depression, and psychological distress have been emphasized to be the key etiological factors in development of clinical eating disorders (Costarelli et al., 2010; Saleem et al., 2014).

Young adulthood has been proved to be a vulnerable time period for both development and prolongation of EDs through previous researches. This has been specifically observed in situations where parents have limited control or influence on eating-related behaviors (Ozenoglu et al., 2015). Also, academic stress contributes to being the dominant causative factor for disordered EA (Sanlier et al., 2008; Costarelli et al., 2010; Alvarenga et al., 2012; Witherspoon et al., 2013; Ozenoglu et al., 2015).

EDs are categorized as: anorexia nervosa (AN), bulimia nervosa (BN) and binge eating disorders (BED) and are emphasized as serious physiological and mental-health problems, significantly predominant in adolescents worldwide (Saleem et al., 2014).

Depression and EDs are interrelated and have a bi-directional relationship. Depression causes impaired EA and conversely, improper food intake and diets cause hormonal changes that consequently lead to manifestations of certain types of depression (Meireles et al., 2017). Majority of data has suggested that most patients of EDs usually also experience depression (Kavas, 2007; Ozenoglu et al., 2015; Meireles et al., 2017). Links have also been established between depressions and altered eating styles which led to poor quality of diet and higher consumption of unhealthy foods (Paans et al., 2019). Young students with higher risks of eating disorders or those who exhibit depressive symptomatology even displayed suicidal tendencies (Nascimento et al., 2019).

Much work has been recently done internationally on both depression and EDs while also critically analyzing other variables such as anxiety, stress, self-esteem, negative body image, and BMI. A few studies have investigated depression and EDs separately in Pakistan (Saleem et al., 2014). Published literature assessing the association between the two variables was scarce in Pakistan. Therefore, this

study assesses the association between depression and EDs among university students in Lahore.

MATERIALS AND METHODS

Study design

A Cross-sectional survey was designed for six months to assess association between eating disorders and depression. Six universities of Lahore both private and government sector were considered and data of participants was collected by using a standard questionnaire.

Sample size

The sample size was calculated online by selecting confidence interval 95% and confidence level as 0.05. In total, 327 students were participated in the study. 22 participants were omitted on the basis of claiming to have self-report clinical depression. Five questionnaires were not filled completely. Therefore, data from 300 students was analyzed.

Sample collection and sampling technique

Convenience sampling technique was used to approach the participants. University students from 17-25 years were considered.

Data collection procedure

The participants were given a brief introduction about the study, and were approached during the spring semester. Participants were selected on a voluntary basis. Researchers were guided for importance of the questionnaire and the importance of providing sincere answers.

Outcome measure tools with validity and reliability

The questionnaire had 3 sections i.e. demographic information form, Eating Attitude Test, and Center for Epidemiologic Studies Depression Scale.

1. Demographic information form

Demographic information including age, gender, level of education (year and semester), degree title, university, city of origin, religion, accommodation, and means of transportation, physical activity, maternal and paternal education, and number of siblings, birth order, and household income were obtained from each participant through the questionnaire.

2. Eating Attitude Test (EAT -26)

Eating Attitude Test (EAT -26) developed by David M. Garner in 1982 was used to assess and classify eating disorders (Garner et al., 1982). EAT-26 is an extensively used tool to identify high-risk cases of eating disorders. This instrument is a screening tool and does not provide diagnosis. It is a tool to recognize early appearances of behaviors and symptoms indicating the imminent presence of an eating disorder. It is the abbreviated form of

the original 40-item scale (Paans et al., 2018).Factor 1-D (13 questions) stands for 'dieting' and correlates with a distorted body image. Factor 2-B (6 questions) denotes 'bulimia and food occupation' and is associated to body weight and related issues (such as perception about one's physical self and tendency towards bulimic behavior). Factor 3-O (7 questions) means 'oral control' and provides information about tendency to self-control. High scores in factor 3 indicate low weight and absence of bulimia (Costarelli et al., 2010). The reliability of EAT-26 is high (alpha= 0.90 for Factor 1-D). EAT is useful in classifying eating disturbances in non-clinical samples. It has been validated with AN patients (Paans et al., 2018). The subjects showed their responses on a Likert scale (0=never, rarely, sometimes; 1=often; 2=usually; and 3=always). 20 is considered the cut-off score for this scale. Participants who have a score of 20 and above are the ones who have an increased risk of eating disorder, whereas scores below 20 indicate not susceptible, or a decreased risk of eating disorder (Costarelli et al., 2010; Monteleone et al., 2005).

3. Center for Epidemiologic Studies Short Depression Scale (CESD- 10)

This scale was employed to screen the subjects for depression. CESD-10 is a short version of the original 20-item CESD tool. It is a self-reporting scale that is used to identify the risk of depression among the general population. It has the reliability of alpha coefficients of 0.85 for general population samples. It has good convergent (0.91) and divergent (0.89) validity (Garner et al., 1982). The CESD is a 10-item Likert scale, and includes three questions on 'depressed affect', five questions on 'somatic symptoms', and two on 'positive affect'. Options for each statement range from "rarely or none of the time" (score of 0) to "all of the time" (score of 3). Scoring is reversed for question 5 and 8, which are 'positive affect' statements. Total scores can range from 0 to 30 (Bjorgvinsson et al., 2013). Final score is obtained by summing the 10 graded items with scores 10 or greater indicating depressed mood (Orbitello et al., 2006).

STATISTICAL ANALYSIS

Data was entered in Statistical Package for Social Sciences version 20. Descriptive statistics, which are mean, standard deviation, frequency and percentage, were calculated for all continuous and categorical variables. Chi square and odds ratio were applied to assess association between depression and ED. A p-value of 0.05 was taken as significant. In the study depression was the independent variable while eating disorders were the dependent variable.

RESULTS

The Results were entered on SPSS 20 and descriptive statistics was done.

Table 1: Descriptive Statistics of Age and Education of Participants

Data of participants	**Mean**	**SD**
Age (years)	21.8867	1.55624
Year of education	2.8733	1.28951
Current semester	5.6833	2.53069
Maternal education (years)	10.1467	5.63005
Paternal education (years)	12.3167	4.78044

Table 1 shows that mean age of the participants was 21.8867 years. Mean education year in their respective universities was 2.8733 year, mean of the semester was 5.6833, mean maternal education of the participants was 10.1467 years and the mean paternal education was 12.3167 years.

Table 2: Socio-Demographic Profile of Participants

Socio-demographic profile of participants		**Frequency**	**Percentage**
Gender	Female	132	44.0
	Male	168	56.0
City of Origin	Other	139	46.3
	Lahore	161	53.7
Religion	Other	0	0
	Islam	300	100.0
Residence Status	Hostelite	98	32.7
	Day Scholar	202	67.3
Accommodation Type	Rent	71	23.7
	Self	229	76.3
Transport	Local	103	34.3
	Bike	115	38.3
	Car	82	27.3
Income (PKR)	< 25,000	25	8.3
	25,000-50,000	82	27.3
	50,000-75,000	83	27.7
	>75,000	110	36.7

The table shows that 56% participants of the study were male and 44% were female. Also, majority of the participants (53.7%) had Lahore as the city of origin. 100% of the participants were Muslim. 67.3% participants claimed that they were day scholars while 32.7% said that they were residing in hostels. 76.3% of the participants had their own accommodations. 38.3% participants used bike as a mode of transportation. Majority (36.7%) of the participants responded that their household income was more than 75,000.

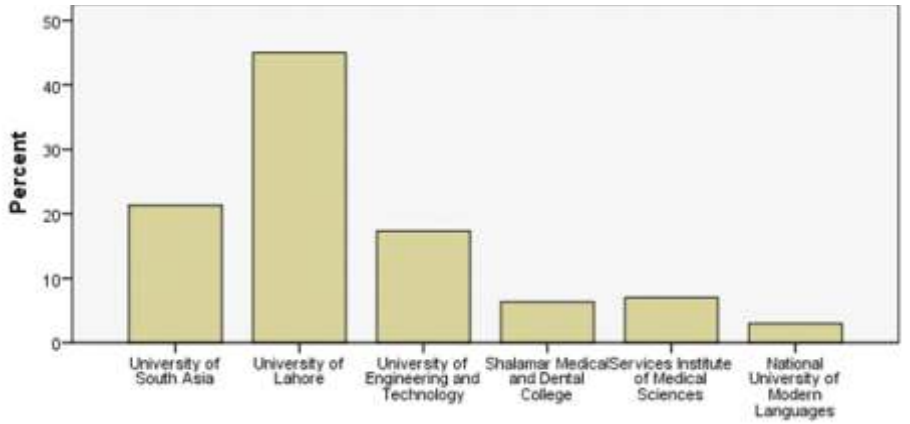

Fig. 1: Name of Universities of the Participants

The majority of the data was collected from University of Lahore (45%), while participants were also included from other universities, namely University of South Asia (21.3%), University of Engineering and Technology (17.3%), Shalamar Medical and Dental College (6.3%), Services Institute of Medical Sciences (7.0%) and National University of Modern Languages (3.0%).

Table 3: Descriptive Statistic of Center for Epidemiologic Studies Depression Scale and Eating Attitudes Test Scores

		Frequency	**Mean**	**SD**
CESD	10 or greater	175 (58.3%)	11.2333	4.88451
	Less than 10	125 (41.7%)		
EAT	20 or greater	111 (37%)	17.3733	12.26385
	Less than 20	189 (63%)		

Table 3 shows that mean CESD score of the participants was 11.2333, while the mean score for EAT was 17.3733. Out of a total of 300 participants, 175 had a score of 10 or greater on CESD, while 125 had a score of less than 10.

189 participants had less than 20 as their score on EAT, and 111 participants had a score of 20 or greater.

Table 4: Association of Depression with Eating Disorders

		EAT		OR (CI)	p-value*
		20 or greater	Less than 20	1.366 (0.845-2.208)	0.226
CESD	10 or greater	70 (40%)	105 (60%)		
	Less than 10	41 (32.8%)	84 (67.2%)		

*Chi-square

Table 4 shows that a score greater or equal to 10 increases the odds of eating disorders 1.366 times, but the association was not statistically significant.

Table 5: Association of Socio-demographic factors with Depression

Variable		Depression present	Depression absent	OR	p-value*
Age	<21	75 (61.9%)	46 (38.0%)	1.288	0.340
	>21	100 (55.8%)	79 (44.1%)		
Gender	Female	83 (62.8%)	49 (37.1%)	1.399	0.194
	Male	92 (54.7%)	76 (45.2%)		
Income	< 25,000	12 (48%)	13 (52%)	-	0.199
	25,000-50,000	42 (52.5%)	40 (48.7%)		
	50,000-75,000	54 (65%)	29 (35%)		
	> 75,000	67 (61%)	43 (39%)		
Residence status	Hostelite	59 (60%)	39 (40%)	1.122	0.708
	Day scholar	116 (57.4%)	86 (42.5%)		
Accommodation type	Rent	42 (59%)	29 (40.8%)	1.045	0.891
	Self	133 (58%)	96 (42%)		

The table shows that a large number of participants (61.9%) who were aged 21 or less years had depression as compared to those aged more than 21 years (55.8%). Also, depression was more prevalent in female participants (62.8%) than male (54.7%). Majority of the middle household income participants (65%) had depression when compared to other socioeconomic statuses. More individuals who had to pay rent had higher chances of depression than those who had their own accommodations.

Table 6: Association of Soio-Demographic Factors with Eating Disorders

Variable		**Eating disorders present**	**Eating disorders absent**	**OR**	**p-value***
Age	<21	49 (40.5%)	72 (59.5%)	1.284	0.330
	>21	62 (34.6%)	117 (65.4%)		
Gender	Female	56 (42.4%)	76 (57.6%)	1.514	0.093
	Male	55 (32.7%)	113 (67.3%)		
Income	< 25,000	10 (40%)	15 (60%)		
	25,000-50,000	30 (36.5%)	52 (63.4%)		
				-	0.960
	50,000-75,000	32 (38.5%)	51 (61.4%)		
	> 75,000	39 (35.4%)	71 (64.5%)		
Residence status	Hostelite	28 (28.5%)	70 (71.4%)		
				0.573	0.041
	Day scholar	83 (41%)	119 (59%)		
Accommodation type	Rent	27 (38%)	44 (62%)		
				1.059	0.838
	Self	84 (36.6%)	145 (63.3%)		

*Chi-square

Table 6 demonstrates that 40.5% of participants who were 21 or less years old and 34.6% who were above 21 years old had an increased risk of having eating disorders.

Female participants also had a higher risk of having eating disorders (42.4%) as compared to male participants (32.7%). 40% individuals belonging to low socioeconomic were seen to be more prone to eating disorders as compared to other classes. However, when comparing residence statuses of the participants, it was seen that day scholars had a higher chance of having eating disorders than hostelites. The results were significant.

Table 7: Descriptive Statistics of Eating Attitudes Test (Dieting Section)

Questions	Always n (%)	Usually n (%)	Often n (%)	Sometimes n (%)	Rarely n (%)	Never n (%)
1. I am terrified about being overweight.	53 (17.7)	31 (10.3)	24 (8.0)	36 (12.0)	29 (9.7)	127 (42.3)
2. I am aware of the caloric content of foods that I eat.	40 (13.3)	48 (16.0)	46 (15.3)	31 (10.3)	41 (13.7)	94 (31 3)
3. I particularly avoid food with a high carbohydrate content (i.e. bread, rice, potatoes, etc.)	36 (12.0)	23 (7.7)	34 (11.3)	40 (13.3)	60 (20.0)	107 (35.7)
4. I feel extremely guilty after eating.	18 (60.)	20 (6.7)	28 (9.3)	29 (9.7)	30 (10.0)	175 (58.3)
5. I am preoccupied with a desire to be thinner.	30 (10.0)	39 (13.0)	35 (11.7)	35 (11.7)	43 (14.3)	118 (39.3)
6. I think about burning up calories when I exercise.	65 (21.7)	42 (14.0)	41 (13.7)	33 (11.0)	38 (12.7)	81 (27.0)
7. I am preoccupied with the thought of having fat on my body.	34 (11.3)	47 (15.7)	43 (14.3)	42 (14.0)	41 (13.7)	93 (31.0)
8. I avoid foods with sugar in them.	38 (12.7)	38 (12.7)	21 (7.0)	42 (14.0)	36 (12.0)	125 (41.7)
9. I eat diet foods.	28 (9.3)	24 (8.0)	24 (8.0)	32 (10.7)	47 (15.7)	145 (48.3)
10. I feel uncomfortable after eating sweets.	35 (11.7)	27 (9.0)	27 (9.0)	39 (13.0)	40 (13.3)	132 (44.0)
11. I engage in dieting behavior.	24 (8.0)	27 (9.0)	32 (10.7)	36 (12.0)	49 (16.3)	132 (44.0)
12. I like my stomach to be empty.	29 (9.7)	26 (8.7)	37 (12.3)	47 (15.7)	46 (15.3)	115 (38.3)
13. I enjoy trying new rich foods.	121 (40.3)	55 (18.3)	39 (13.0)	36 (12.0)	24 (8.0)	25 (8.3)

Majority of the participants marked 'never' for all the questions, except in question no. 13 where they gave 'always' as the answer and said that they enjoyed trying new foods.

Table 8: Descriptive Statistics of Eating Attitudes Test (Bulimia and Food Occupation Section)

Questions	Always n (%)	Usually n (%)	Often n (%)	Sometimes n (%)	Rarely n (%)	Never n (%)
1. I find myself preoccupied with food.	22 (7.3)	33 (11.0)	58 (19.3)	60 (20.0)	54 (18.0)	73 (24.3)
2. I have gone on eating binges where I feel that I may not be able to stop.	23 (7.7)	46 (15.3)	39 (13.0)	29 (9.7)	40 (13.3)	123 (41.0)
3. I vomit after I have eaten.	16 (5.3)	9 (3.0)	22 (7.3)	23 (7.7)	30 (10.0)	200 (66.7)
4. I feel that food controls my life.	50 (16.7)	41 (13.7)	44 (14.7)	41 (13.7)	38 (12.7)	86 (28.7)
5. I give too much time and thought to food.	31 (10.3)	31 (10.3)	44 (14.7)	45 (15.0)	58 (19.3)	91 (30.3)
6. I have the impulse to vomit after meals.	17 (5.7)	18 (6.0)	17 (5.7)	24 (8.0)	30 (10.0)	194 (64.7)

24% participants marked 'never' for finding themselves preoccupied with food. 41% said that they have never gone on eating binges where they feel that they might not be able to stop. 66% individuals said that they do not vomit after eating. Also, 64% said that they do not have the impulse to vomit after meals.

Table 9: Descriptive Statistics of Eating Attitudes Test (Oral Control Section)

Questions	Always n (%)	Usually n (%)	Often n (%)	Sometimes n (%)	Rarely n (%)	Never n (%)
1. I avoid eating when I am hungry.	11 (3.7)	25 (8.3)	21 (7.0)	52 (17.3)	60 (20.0)	131 (43.7)
2. I cut my food into small pieces.	60 (20.0)	57 (19.0)	52 (17.3)	43 (14.3)	38 (12.7)	50 (16.7)

43% participants said that they never avoided eating when hungry. 35% said that they do not feel that others would prefer if they ate more. 34% also said that they do not feel that others pressure them to eat more.

Table 10: Descriptive Statistics of Center for Epidemiologic Studies Depression Scale

Questions	Rarely or None of the Time (Less than 1 day) n (%)	Some or Little of the Time (1-2 days) n (%)	Occasionally or Moderate Amount of Time (3-4 days) n (%)	Most or All of the Time (5-7 days) n (%)
1. I was bothered by things that usually don't bother me.	116 (38.7)	108 (36.0)	38 (12.7)	38 (12.7)
2. I had trouble keeping my mind on what I was doing.	90 (30.0)	104 (34.7)	74 (24.7)	32 (10.7)
3. I felt depressed.	88 (29.3)	108 (36.0)	63 (21.0)	41 (13.7)
4. I felt that everything I did was an effort.	54 (18.0)	85 (28.3)	93 (31.0)	68 (22.7)
5. I felt hopeful about the future.	44 (14.7)	36 (12.0)	70 (23.3)	150 (50.0)
6. I felt fearful.	140 (46.7)	86 (28.7)	49 (16.3)	25 (8.3)
7. My sleep was restless.	116 (38.7)	92 (30.7)	44 (14.7)	48 (16.0)
8. I was happy.	31 (10.3)	59 (19.7)	115 (38.3)	95 (31.7)
9. I felt lonely.	114 (38.0)	78 (26.0)	54 (18.0)	54 (18.0)
10. I could not get "going".	95 (31.7)	96 (32.0)	73 (24.3)	36 (12.0)

38% participants marked that they were rarely bothered by things that usually don't bother them. 50% said that they felt that everything they did was an effort most of the times and 46% said that they rarely felt fearful.

Table 11: Descriptive Statistics for Eating Attitudes Test

Section	No. of Questions	Max Score	Mean	S.D
Dieting	13	42	8.80	8.05861
Bulimia and Food Preoccupation	6	16	3.54	3.33845
Oral Control	7	18	5.42	3.87660

Mean score of participants on dieting section was 8.80, on bulimia and food preoccupation was 3.54 and 5.42 on the oral control section.

DISCUSSION

Depression leads to impaired eating attitudes and conversely, improper food intake and diets cause hormonal changes that subsequently lead to manifestations of certain types of depression. The study aimed to assess the association between depression and eating disorders in university students of Lahore. Analysis of literature has exhibited that depression and eating disorders are interrelated (Meireles et al., 2017). The data of 300 participants was collected from 6 different universities of Lahore, including both government and private sector universities. The majority of the data was collected from University of Lahore, while participants were also included from other universities, in a period of approximately 2 months (Fig. 1). 21 years was the mean age of the participants of the study, 56% of which were male. The mean age of participants in majority of the studies was 20 and 21 (Alvarenga et al., 2012; Ozenogluet al., 2015; Meireleset al., 2017).The total study population data included 300 participants from which 77% were undergraduates and 23% were postgraduate students. 47.7% participants claimed that they were moderately active, 33.3% had a sedentary lifestyle. Data suggested that more of the participants were day-scholars.

The prevalence of both depression and EDs was found to be high in the participants (58.3% and 37% respectively. In a study on nutrition and Dietetic students, it was seen that a greater percentage of the participants had significantly increased scores on both EAT and BDI (Ozenoglu et al., 2015). The results also suggested an increased risk of eating disorders in participants with depression, however, the association was not statistically significant. Many previous studies also had similar results where the findings showed that depression is a factor causative of eating disorders. Thus, treating depression could reduce risk of eating disorders (Alvarenga et al., 2012; Meireleset al., 2017).

Adolescents, especially

females are more susceptible to depression. The results showed 21 or less years old female participants were more prone to depression. Other studies also favored these results and suggested that age, pubertal status and gender are key components associated with depression throughout the life span (Meireles et al., 2017). A study that also used EAT-26 revealed that from the total sample of students, more girls than boys reported having disordered eating attitudes (Yousaf et al., 2011). This study also observed depression and eating disorders with socio-demographic factors. When comparing household income of the participants to depression, the individuals belonging to middle-income families came out to be those with the highest risk of being depressed and on the other hand, individuals who did not own their houses and had to pay rent were also found to be more susceptible to depression. When compared with EDs, the study concluded that participants belonging to low- socioeconomic status were more inclined to having EDs than other classes. Also, significant association was seen in day-scholars and increased chances of EDs (p-value=0.041).

Convenience sampling was a major limitation. Random sampling techniques may have produced a different result. Along with that, the data was self-report which allowed possibility of errors on part of the participants and decrease the authenticity of the data provided. A larger sample size could have generated a significant association between the two variables. EAT-26 and CESD-10 are both screening tools for eating disorders and depression respectively and did not provide diagnoses, but susceptibility for these diseases. Further studies can benefit by including diagnostic tools and by employing interviewing techniques.

Depression and eating disorders have not been used together as variables for research in Pakistan and thus can be used as a milestone for more detailed studies in the future. Although, significant associations were not observed between the variables, higher risks and increased prevalence suggested the need for further researches using similar variables.

CONCLUSION

There was no significant association found between depression and eating disorders but depressed individual had higher incidence of eating disorders. Both variables were not associated with age and gender. An interesting fact was observed in the results which suggested that participants from middle-income socioeconomic backgrounds had an increased susceptibility to depression than high and low socioeconomic status. Moreover, there were increased chances of depression in individuals who paid rent for their accommodations than those who did not. Findings on eating disorders when compared with socio-demographic factors concluded that there was significant relationship between day-scholars and increased chances of

eating disorders. It is recommended that individuals diagnosed with depression should be screened for eating disorders and vice versa.

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Conflict of Interest Statement

The authors declare that there is no conflict of interest.

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Relationship Analyses of Overweight and Obesity with Liver Function

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ABSTRACT: *Obesity is a treatable medical condition marked by a high accumulation of fats in the body, a result of food intake or lowered bodily exercise. Obesity is one of the widespread causative factors for liver health. The liver performs a central function in carbohydrate, protein, fats metabolism and detoxification. This research aims to examine the impact of overweight and obesity on female liver functions and to exhibit the correlation of BMI with liver enzymes in normal, overweight and obese subjects. In this cross-sectional study, a complete of 75 subjects was enrolled. Sampling was carried out from Lahore College for Women University, Lahore. Liver enzymes Alanine aminotransaminase (ALT), Aspartate aminotransferase (AST) and Alkaline phosphatase (ALP) had been analyzed through a chemistry analyzer. The enrolled subjects were classified into three groups based on BMI i.e. Normal weight (n=25), overweight (n=25) and obese (n=25), following the WHO criteria. Correlation analysis of BMI with liver enzymes demonstrated that ALP was positively correlated with BMI in obese (r= 0.328) and overweight (r=0.198) subjects. A significant relationship was observed between ALT and BMI in obese subjects(r=0.467). AST and BMI (r=0.074) showed a direct correlation in overweight subjects. So it was concluded that obese and weight problems significantly affect liver function and may result in further complications of the liver.*

Key words: *Alanine Aminotransaminase (ALT), Aspartate Aminotransferase (AST) and Alkaline Phosphatase (ALP), Body Mass Index (BMI), World Health Organization (WHO).*

INTRODUCTION

Obesity is a curable medical issue characterized by using extended deposition of fats in the body as a result of increased calorie consumption and diminished body activity. Internationally, the World Health

Organization (WHO) classifies the obesity and weight issues on the foundation of body mass index (BMI) (James et al., 2001). Pakistan was ranked 9thamong 188 countries in carrying the obese population (Marie et al., 2014). As weight problems are growing in all age groups of Pakistan due to sluggish mode of life and a high number of individuals which seems healthy and they are struggling with overweight and obesity. At the same time, they are unaware of problems that can be a possible source of various relevant diseases. There has been a significant increase in the prevalence rates of overweight and obesity in many nations around the world in recent decades (Alan and Alam, 2004).

Body mass index (BMI) is regarded as a convenient, acceptable, accurate, and low-priced measurement for estimating the occurrence of obesity, while waist circumference (WC) is advocated as the most correct and realistic measure of abdominal adiposity (WHO, 2005). Obesity is a necessary predictor of various diseases as well as one of the hazard elements most often related to expanded liver enzymes. The liver is a large abdominal organ with a central role in metabolism (Straus et al., 2000).

Hepatocytes function a variety of essential immunological roles, in addition to their vital metabolic roles (Giannini et al., 2005). Fatty liver is the most vital disorder of the liver cells and a reversible disease created by large storage of fats (triglycerides) in liver cells. Fats make up more than 5% of the liver's weight in fatty liver (Sherlock and Dooley, 2008).

For instance, a research study in Korea aimed to make clear whether or not precise health behaviors had been related to liver function in obese adolescents. Students have been examined for liver enzymes and health behavior (Lee et al., 2018). Abnormalities of Non-alcoholic fatty liver disease (NAFLD), together with an advanced stage of fibrosis can be viewed in teenagers with ordinary or mildly improved ALT levels. Pasanta et al. (2018) assess the association between liver fat content (LFC) and weight status in young adults using proton magnetic resonance spectroscopy (1H MRS) technique. A total of 78 healthy subjects in the young adult age group (19-30 years old) participated in this study. Blood biochemical quantity and 1H MRS was performed for LFC assessment.

Johansen et al. (2020) determined the concentration of ALT, AST, LDH and ALP decreased with age in both females and males, while GGT and bilirubin were comparable across age groups in females and increased slightly with age in males. Children and adolescents with overweight or obesity exhibited higher concentration of ALT in all age groups. Elevated plasma concentration of liver enzymes are routinely used as markers of liver injury in adults and children.

The present study was aimed to identify the impact of weight problems on liver functions and to illustrate the correlation between BMI and waist circumference with liver enzymes in

obese, overweight and normal females.

MATERIALS AND METHODS

Study Design and Bio data Collection

A group of 75 healthy females of age 16- 35 years was randomly chosen for the study. This cross-sectional study was accompanied at the Department of Zoology at Lahore College for Women's University, Lahore, to measure liver characteristics of 75 female serum samples. The subjects were divided into three groups based on BMI i.e. normal weight ($<25 Kg/m^2$), overweight (25.1-30Kg/m^2) and obese subjects (>30 Kg/m^2). Anthropometrical measurements consisting of age, height, weight, BMI and waist circumference were recorded.

A questionnaire had been specifically designed to obtain information on socio-demographic data (age, sex, socioeconomic status) and medical history of subjects (health status, family history of liver disease, family history of obesity, family history of diabetes, alcohol consumption and passive smoking). Data collected about physical activity, life style and fast food intake. Physical activity categorized into active subjects, moderately active subjects and sedentary subjects. All procedures for the study have been permitted and approved through the Ethical Review Committee of the Department of Zoology at Lahore College for Women University.

Measurement of Liver Enzymes

Venous blood (5ml) was drawn from each person. Serum was then stored at freezing temperature of -20°Cfor future analysis. Liver function tests of serum Alanine transaminase (ALT), Aspartate aminotransferase (AST) and Alkaline phosphatase (ALP) were then analyzed in the laboratory using a chemical analyzer (Chem-7 Erba Mannheim). For the measurement of ALP (U/L), ALT(U/L) and AST(U/L), commercially available kits (1003 LOT, 2006), (Cat No. CZ 902-L) and (AFO1 3010-051) were used respectively.

STATISTICAL ANALYSIS

Statistical analysis was done by using SPSS (Version 22.0). Data was statistically investigated and was presented in the form of graphs, charts and tables. Mean values were calculated and expressed as ±SEM. One way ANOVA was performed to reveal the significant difference among the groups. Data were statistically analyzed and presented in the form of graphs, charts and tables. Mean values have been calculated and expressed as ±SEM. The variance analysis (ANOVA) test was performed to detect a significant difference between the groups. The correlation was completed to determine the association between BMI and liver enzymes in the groups studied.

RESULTS

The prevalence percentage of the family history of liver disease,

obesity, diabetes, alcohol intake and lifestyle was recorded (Table 1).

The mean age of the studied groups for normal, overweight and obese group was recorded as 22.7±1.89 years, 21.4±0.63 years and 29.28± 2.0 years respectively. The mean BMI of normal, overweight and obese subjects was 21.49±0.36 kg/m2,26.73±0.21 kg/m2and35.73±1.39kg/m2 with a greatly significant difference ($p<0.05$) among the groups respectively. Mean waist circumference of normal subjects was 78.2±1.35. The mean waist circumference of overweight subjects was 86.64±1.31. The suggested waist circumference of obese subjects was 101.32±2.151 compared by ANOVA and a very high significant difference among the groups was recorded (p-value ? 0.01) Table 2.

Non-significant difference in mean values of liver enzymes was observed when compared with different classes of obesity (Table 3).

Pearson correlation revealed that relation between BMI and ALP In normal subjects is (r=0.016). Direct significant in overweight subjects (r=0.198) and obese subjects (r=0.328).In normal subjects, it was detected that ALT was slightly correlated with BMI (r= 0.223). In overweight subjects an indirect relation (r=-0.258) was observed and in obese subjects relation between the BMI and ALT was direct and highly significant(r=0.467*). In normal subjects, AST was slightly correlated with BMI (r=0.164) and positively, correlated with BMI (r=0.074) in overweight subjects. While, in obese subjects, AST was negative correlated with BMI (r= -0.162) (Table 4).

Table 1: Frequency Distribution of Risk Factors and Lifestyle in Studied Subjects

Risk Factors	Frequency (n)	Percent%
Family History of Liver Disease		
Yes	**34**	**54.67**
No	**41**	**45.33**
Family History of Obesity		
Yes	**53**	**70.67**
No	**22**	**29.33**
Family History of Diabetes		
Yes	**49**	**65.33**
No	**26**	**34.67**
Passive Smoking		
Yes	**27**	**36**
No	**48**	**64**
Alcohol Intake		
Yes	**14**	**18.67**
No	**61**	**81.33**
Lifestyle		
Physical Activity		
Active Subjects	**15**	**20**
Moderately active subjects	**33**	**44**
Least active subjects	**27**	**36**
Fast food intake		
Daily	**18**	**24**
Sometimes	**45**	**60**
Don't eat	**12**	**16**

Table 2: Demographic Characteristics and Mean Liver Enzymes ± S.E.M in studied groups

Serial No	Variables	Normal Group	Overweight Group	Obese Group	
		(n=25)	(n=25) Mean± SEM	(n=25) Mean± SEM	P value ANOVA test
1.	**Age (Years)**	22.7±1.89	21.4±0.63	29.28±2.10	0.002**
2.	**Height (m)**	2.56±0.48	2.53±0.54	2.39±0.05	0.036*
3.	**Weight (Kg)**	54.4±1.23	66.2±1.51	83.9±2.72	0.001***
4.	**Waist circumference (cm)**	78.2±1.35	86.64±1.31	101.32±2.15	0.001***
5.		21.49±0.364	26.73±0.213	35.73±1.393	0.001***
6.	**Alkaline Phosphatase ALP (U/L)**	138.52±19.65	148.60±16.36	158.5±18.72	0.743^{ns}
7.	**Alanine Transaminase ALT(U/L)**	66±17.37	57.0±10.74	138.2±26.89	0.008**
8.	**Aspartate Transaminase AST(U/L)**	41.5±6.60	62.38±8.74	99.34±16.14	0.002**

Abbreviation:

P > 0.05----Non Significant

*P-value = 0.05---significant

**P-value=0.01---Highly significant

***P-value=0.001---Highly-significant

Table 3: Mean Values of Demographic Characteristics, and Liver Enzymes ±SEM in Obese Subjects.

Variables	Obese class I	Obese class II	Obese class III	ANOVA Test
Age (yrs)	26.27±2.41	30.0±6.36	31.0±4.0	0.124^{ns}
BMI(kg/m²)	31.11±0.32	36.72±0.71	46.71±1.81	0.000***
Waist Circumference (cm)	96.27±1.45	102.0± 1.08	113.5±5.91	0.001**
ALP (U/L)	126.5±18.95	199.5±67.38	210.9±37.3	0.108^{ns}
ALT (U/L)	90.18±20.0	189.5±110.3	224.2±61.6	0.079^{ns}
AST (U/L)	112.9±25.0	69.32±21.4	85.43±19.5	0.581^{ns}

Abbreviation:

P > 0.05----Non Significant

*P-value = 0.05---significant

**P-value=0.01---Highly significant

***P-value=0.001---Highly-significant

Table 4: Correlation Analysis of Liver Function Test with BMI in Normal, Overweight and Obese subjects.

Correlation of Liver enzymes with BMI	Normal weight (n=25)	Overweight (n=25)	Obese (n=25)
Alkaline phosphatase (U/L)	r=0.016 p= 0.940	r= 0.198 p= 0.342	r=0.328 p=0.110
Alanine transaminase (U/L)	r= 0.223 p=0.285	r=-0.258 p=0.213	r=0.467* p= 0.018
Aspartate transaminase (U/L)	r=0.164 p= 0.433	r=0.074 p=0.726	r=-0.162 p=0.439

Abbreviation:

P > 0.05----Non Significant

*P-value = 0.05---significant

**P-value=0.01---Highly significant

***P-value=0.001---Highly-significant

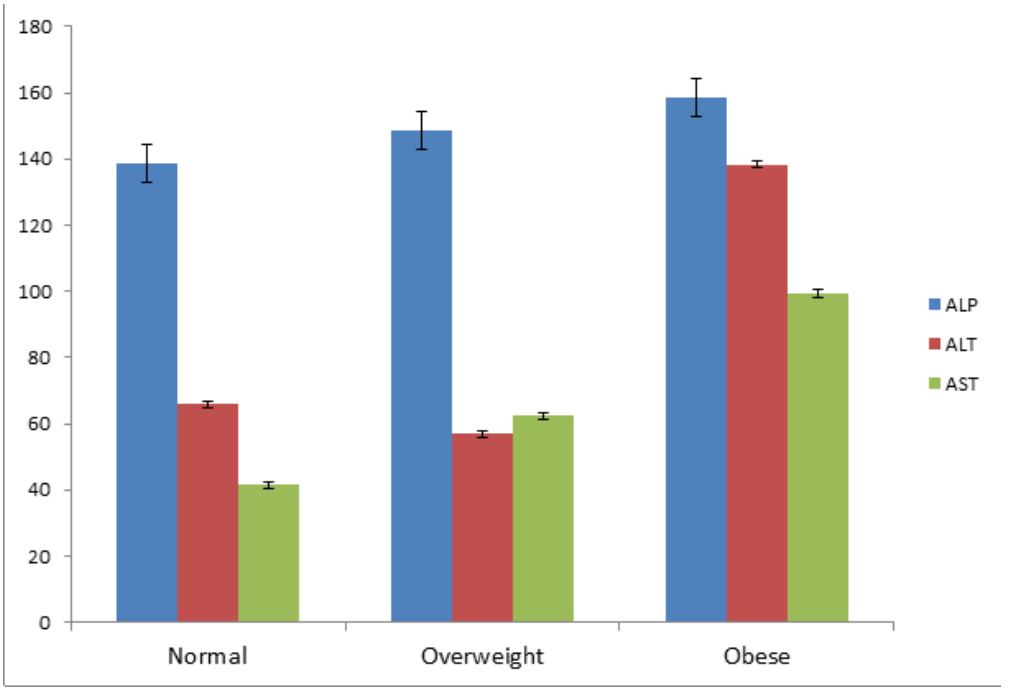

Fig. 1: Comparison of Mean liver enzymes (U/L)±S.E.M in Normal, Overweight and Obese Subject

DISCUSSION

The study of impact of overweight and obesity on liver function test was designed to determine and to correlate the effect of BMI with liver enzymes. This study shows that, in a cohort of individuals, obesity was significantly associated with liver enzymes.

In our study, 75 females were included, in which n= 25 were normal, n=25 were overweight and n=25 were obese. They were divided into three classes in accordance to BMI, which are: Group I (Normal), group II(Overweight), Group III (Obese).

In this study, several questions were included such as family history of liver disease 54.7% (n=41), family history of obesity 70.67% (n=53), family history of diabetes 65.33% (n=49), alcohol intake 18.67 (n=14), passive smoking 36% (n=27) as well as

about lifestyle such as physical activity (n=15) 20%and fast food intake (n=18) 24% included in studied subjects. In our study percentage of fast food intake who daily eat was 24% and people who eat once or twice in a week was 60% and people who has sedentary lifestyle was 36% in studied subjects.

Our study is same as Gu et al. (2009) a questionnaire was used to acquire demographic data, lifestyle factors (smoking and physical activity), clinical history, and family history of obesity, smoking, alcohol consumption, and physical activity and family history of chronic diseases), the association of overweight and obesity with liver disease was decreased but still significant for both sexes.

Lee et al. (2018) aimed clarify whether or not accurate healthy habits have been related with the elevation of liver enzymes among obese adolescents in Korea. First, among all subjects studied, body shape self-image and weekly frequency of ingestion of fast food were positively associated with accelerated levels of AST and ALT (Lee et al., 2018).

In our study, one way ANOVA was applied to assess the differences in anthropometric variables and liver enzymes. The p-value (typically ? 0.05) in ALP showed the non-significant difference between the groups, (0.743ns) because ALP was not affecting in normal group. The p value of ALT between the groups was (p=0.008**) showed high significant difference among the groups. p-value (0.05) and p-value of AST among the groups was (0.002**) showing highly significant difference.

Our study is same as that of Qureshi et al. (2006). By using one way ANOVA Comparison among obese, overweight and normal subjects were made. A probability p value less than 0.05 was well-thought-out significant difference and values of ALT, AST, and ALP were significant with BMI. The p-value (typically 0.05) is significant.

In our study, ALP were positively correlated with BMI (r= 0.328) in obese subjects. ALT was found noticeably significant which correlated with BMI (r=0.467*). AST was shown a negative correlation with BMI (r= -0.162). In group ii, ALP was also positively correlated, (r=0.198) in overweight subjects. ALT with BMI was negatively correlated in overweight subjects. (r=-0.258). AST was positively correlated with BMI (r=0.074). In normal subjects (Group iii), BMI was not effecting on ALP in normal subjects. ALT was barely correlated with BMI (r= 0.223). AST was slightly correlated with BMI (r=0.164).

Adams et al. (2008) in their study determined that the majority of the subjects had been either overweight (41%) or obese (17%). A minority of subjects were average (25%) or heavy drinkers (4%). With liver enzymes, BMI and waist circumference have been strongly associated (Adams et al., 2008).

In another study of Das et al. (2014) individuals have been divided into three groups on the basis of BMI. In Group I, Total no. of people was 72, in Group II, subjects were 39 and in Group III they were 45. From their study it was considered that the range of female subjects was greater as in contrast to adult males in Group II and III. In all the three group values of ALT, AST was within the normal reference range. However, there was an increase trend in the values from normal to obese. ALT, AST showed no significant relation and GGT and weight problems as the p value was> 0.01 when in contrast between Group II and Group III.

In our study of 75 females out of which n=25 were obese according to BMI and their p value is (0.001**) which shows highly significant difference between the groups. Overall BMI was high in obese females and 36% (n=27) was passive smoker and (n= 14) 18.67% was alcoholic and tobacco user.

Pasanta et al. (2018) assessed the association between liver fat content (LFC) and body mass index in young adults. Our findings was same as (Pasanta et al. 2018) and we determined the association of liver enzymes with BMI. Johansen et al. (2020) determined the concentration of ALT, AST, LDH and ALP decreased with age in both girls and boys, while GGT and bilirubin were comparable across age groups in girls and increased slightly with age in boys. In our study, we determined the concentration of ALT, AST, ALP with normal, overweight and obese subjects. Our study was same as Diehl (2004), he reported joined outcomes of BMI and alcohol consumption on liver. Both elements have been associated to liver disease and, more importantly, they mentioned a supra-additive interaction between the two.

In the other study, the relationship between BMI and alcohol consumption and the prevalence and incidence of abnormal serum liver enzyme activity in each cross-section and potential pattern was investigated by Lee et al. (2001).

In conclusion, the present analysis suggests that obesity is virtually one of the most serious reasons of excessive serum activities of the hepatic enzymes in subjects examined throughout study, and this study about it suggests that extended BMI is related with extended serum ALT, AST, and ALP activities in females. Elevated serum hepatic enzyme activities are related with the excessive prevalence of fatty liver, which was regularly determined in subjects with excessive BMI.

CONCLUSION

The correlation analysis revealed the direct association of liver enzymes with BMI. The present analysis suggests that obesity is undoubtedly one of the most significant causes of the hepatic enzyme's elevated serum activity.

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Zoonosis: Origin and Control of Zoonotic Diseases: A Mini Review

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ABSTRACT: *Evolving infectious diseases have been a reason for significant worldwide threats to health of human beings. In most cases, humans are unintentional hosts of an infectious cycle sustained by animal hosts, comprising insects as well. The rise of new contagious ailments such as severe acute respiratory syndrome (SARS), pandemic influenza and HIV/AIDS has revealed the susceptibility of humans to novel zoonotic health emerging intimidations. These infections are initiated by many different pathogenic agents. According to an estimate about 50 % of the approximately 1000 species of pathogens that are prominent in livestock and pets are zoonotic in nature. In past 60 years, many developed countries have effectively controlled zoonotic diseases through expensive public investments, easing synchronized involvements, comprising "test and slaughter," feed prohibitions, massive vaccination of livestock and wildlife, education, health, and milk pasteurization processes. These are extremely effective approaches of eradicating zoonotic diseases which necessitate important, effective, legal, and economic insurances. Main purpose of this mini review article is to highlight the origin and control of pandemic zoonotic diseases which are the demand of time and need of the present era.*

Keywords: *Eradicating, Infectious, Zoonotic, Significant, Pandemic, HIV, Insects, Livestock*

INTRODUCTION

Zoonotic diseases are generated by various diverse groups of pathogens e.g. viruses, bacteria, and parasites. Moreover, from these evolving infectious diseases health of human beings have significant threats worldwide. In maximum cases, humans are unintentional hosts of an infectious cycle that is sustained by animal hosts, comprising insects as

well (Schelling et al., 2003; Alexander et al., 2012; Nyhus, 2016). The transmission of these zoonotic agents among humans, animals, and the environment upsets the human activities, their health and particularly affects economic areas. According to the Institute of Medicine (2009), zoonotic pathogens are main agents for more than 65% of emerging infectious disease proceedings in the past six decades (World Bank, 2010). The epidemiological studies against old pathogens like Mycobacterium bovis and various bacilli species showed they may transmit via ingestion of contaminated milk, or inhalation. However, by pasteurization practices there are fewer chances to gain digestive route infections as compared to airborne infections (Thoen et al., 2006). By research and knowing the route of transmission of these agents human ultimately is remained successful to prevent the spread of such diseases. However, by the rise of new communicable diseases such as Severe Acute Respiratory Syndrome (SARS), Influenza, HIV/AIDS, and pandemic COVID-19 have revealed the susceptibility of humans to new health emerging intimidations. Deaths and transmission of disease linked with HIV/AIDS have overwhelmed communities in certain countries and had led to worldwide fluctuations in the public health system. A speedy pestilence feast of SARS coronavirus in 2003, a triple reasserting H1N1 influenza in 2009, and COVID-19 together lead to in significant economic forfeiture as the pathogens subjugated. In some cases, they results in close down of worldwide travel and disturbed the whole trade systems. Susceptibilities of such type emphasized the need for an organized, preventive methodology that wishes to avert the spread, or even the preliminary occurrence of pandemics. An advent of unfamiliar pandemic mediators frequently appears to be naturally impulsive. Certainly, no pathogens have been anticipated earlier to their first advent. An appearance of these emerging infection agents most often appears to be random (Murphy, 1998). Although, sequence in the beginning and feast of novel pathogens can be prominent and are a fundamental part of observation strategy. According to Jones et al., (2008) more than sixty percent of the roughly four hundred evolving transferrable diseases that have been recognized since 1940 are zoonotic in nature. The agents are attention of specific public health interests (Oaks and Lederberg et al., 1992). Likewise, specific ecological expanses or boundaries in the people, livestock, wildlife, and the environment have been recognized as the origins of recent developing transmissible diseases, and thus are objectives for the strong surveillance (Jones et al., 2008). Exploration of former events has managed to an improved understanding of the drivers of emergence of Zoonotic diseases. These developments, coupled with an enhanced understanding of the dynamics of pathogens their transmission biology, evolution, increase and spread, help in potential possibilities to forecast pandemics. Here we review the origin and control

of Zoonosis.

ORIGIN OF ZOONOSIS

In the human population the roots of zoonotic diseases are too old and their first appearance was related to time when spread of certain diseases e.g. rabies, anthrax, plague, yellow fever etc. were common. Prior to 20th century awareness was developed about these zoonotic diseases when characteristic samples were needed to be exposed to control these diseases. In the spread of these diseases three factors are considered important; primarily the occurrence and growth rate of new pathogens one and still high, even when the improved surveillance worldwide is considered into justification (Jones et al., 2008), suggesting that energies to synchronize the worldwide strategies to fight pandemics are an appropriate level and of growing significance (Morens et al., 2004; Lederberg et al., 2003). Secondly, the advent of all main groups of emergent transmissible diseases associates strappingly with human population thickness, supportive to the hypothesis that appearance of ailments is driven largely by fluctuations in human systems, such as the extension of agriculture, ways of transport, trade, and modifications in land usage (Weiss and McMichael, 2004). Lastly, the appearance of animal pathogens from wildlife source (which have subjugated the pandemics of the previous 100 years) associated intensely with both human thickness and the worldwide distribution of biodiversity (Jones et al., 2008). SARS like diseases are appeared in China in 2003 and one of the important examples of zoonosis which is caused due to coronaviruses of bats. It was spread in humans due to use of bats as foodstuff (Wang et al., 2008). In the wildlife marketplaces of Southern China these bat viruses appeared to developed stage 1 pathogens and escaped over to civets earlier being spread to people (Guan et al., 2003). This coronavirus then observed for frequent cycles of spread in people, and later countrywide and then worldwide. A higher spread rates was recorded in dense populations as compared to thin populations, and transmission was every so often greatly enriched by air travel or human migration. The mathematics of such dispersion occasions is well recognized, and a sophisticated collection of computational replicas have been used to back-predict such happenings perfectly. Moreover, in the course of the summer of 2003, an outburst of monkey pox happened in the USA with 37 definite human cases (Reed et al., 2004). Monkey pox was an unusual zoonosis triggered by a poxvirus that characteristically happens in African continent. Monkey pox was first originated in monkeys in 1958 and after that it appeared in various other animals like rodents and African squirrel. Similarly, in various pandemic zoonoses like HIV/AIDS, they have also attained from animals (non-human primates) and later transmitted via constant person-to person contact (Keele et al., 2006). So, it is clear in zoonoses spread to human beings happened by interaction with diseased animals. The outburst was

epidemiologically connected to animals in various cases. Presently spread of COVID-19 is a good example of Zoonosis. In such cases the transport, trade, or dispersal of animals, or the introduction of animals into the surroundings, can signify a risk for transmission of zoonotic disease. Spatially, obvious imitations can be used to be familiar with the areas that mostly involved producing the next evolving zoonosis (so-called hotspots of developing transmissible disease) (Jones et al., 2008).

These are few main areas such as National Parks and their adjoined areas where human actions take place alongside background of extraordinary wildlife diversity, with connected microbial diversity (Dhakal, 2016). It was reported from the Chitwan National Park even with the bites of small animals such as insects some park visitors lost their lives. According to Kruse et al. (2004) wildlife animals are rich reservoir of pathogens and possible source for diseases transmission in humans. Aiming of surveillance to such areas delivers a justification for better distribution of global funds to preclude developing infectious disease or swiftly deals with outbursts (Keesing et al., 2010). The procedure through which pandemic zoonosis arise can be analyzed to recognize the vital controller points and definite research tasks. That human populations are frequently exposed to an extensive diversity of non-human animal pathogens. To measure the role of pathogens ecology in appearance, researchers need to identify how many people are exposed to pathogens. A complete account of data is not accessible, but if investigators have a sufficient working about understanding of pathogens of livestock and pets then it helps to evaluate the transmission of zoonotic diseases (species in recurrent interaction with humans). Nearly 50% of the approximately 1000 species of pathogens that are prominent in livestock and pets are zoonotic in nature (Cleaveland et al., 2001), suggesting that any blockades between these hosts and humans are regularly breached by many diverse pathogens. More than 50% of the recognized pathogens of humans can harm other vertebrate's host (Taylor et al., 2001). Various non-human pathogens can harm numerous hosts, and vibrant examples of viruses relocating between diverse animal hosts to cause outbreaks in many other species have been described (Cleaveland et al., 2001; Parrish et al., 2008). Pathogens can be transferred from humans to animals and among various animal species before being shifted back to humans, permitting revising and evolution with spill-back and possibly heightened pathogenicity (e.g. influenza) (Barber et al., 2001; Dawood et al., 2009). Human pathogens comprised of all animal taxa. Approximately 80% of viruses, 50% of bacterial, 40% of fungal, 70% of protozoan, and 95% of Platyhelminthes's are infecting humans. Most of the recognized reservoirs of pathogens are studied in mammalian group (roughly 80%) or, to a lesser extent in birds (Taylor and Woolhouse et al., 2001; Woolhouse and Gowtage-Sequeria, 2005). Although

people are also sharing some pathogens with invertebrates, which act as a vectors (Kilpatrick and Randolph, 2012) or intermediate hosts. Recognition of the key taxonomic groups that are sources for the emergence of zoonotic disease could help to improve targeting of investigation and interventions.

The animals such as hoofed mammals are those with which humans are sharing the maximum pathogens (Cleaveland et al., 2001). This may be not surprising because, as key food sources, these animals are often in close proximity to people. Rodents, carnivores, and primates are also well studied for spread of various diseases in human. It is also well known that the pathogens which may be considered emerging or re-emerging are excessively likely to be zoonotic (Keesing et al., 2010). Moreover, their reservoirs are much the same as those of non-emerging zoonotic diseases (Woolhouse and Gowtage-Sequeria, 2005).

CONTROL OF ZOONOSIS

In the last sixty years, lots of industrialized developed countries have effectively managed or eradicated zoonotic diseases with the help of expensive public investments easing synchronized involvements, comprising "test and slaughter," feed prohibitions, massive vaccination of livestock and wild fauna, education, health, and milk purification processes. These are extremely significant approaches of eradicating zoonotic diseases which necessitate significant effective, legitimate, and economic insurances (Keusch et al., 2009). In many emerging countries, investigation of pandemics are not acknowledged as "unique-health" alliance amongst human medication and veterinary medication. In accumulation, numerous countries possess deficiency in diagnostic capability and health organization. In cattle populations, determinations have principally concentrated on applying avoidance and extermination processes with less stress on the outcome of modification (spread management) approaches, taking into attention the financial and expansion effects at the macro (nationwide budget, atmosphere) or micro (health system, incomes, food-safety of small-scale agriculturalists) levels. Various industrialized countries are capable to manage or decrease the threat of diseases complete community investments in preventive actions such as investigation and reimbursement of agriculturalists for discarded typical in the incident of outbreaks. In April 2001, the UK government thrashed by devastating two million animals in UK to stop epidemic of foot-and-mouth disease (Sobrino and Domingo, 2001). Similar intrusions are not practical in many developing countries due to reduced investigation system, incomplete institutional capability, and deprived support or, deficiency of resources (Zinsstag et al., 2007). Education platforms to rush manufacturer level bio-safety processes were applied in developing countries without vigilant deliberation on how to modify conduct of modest

producer's sustainability, not supported by great level of governmental backing (Narrod et al., 2011). Fruitful outlay in zoonosis regulation needs valuation of the price of disease and the cost-efficacy of projected involvements, moreover, to the adjustments of the involvements to the indigenous background.

Cost calculations of zoonosis necessitate comprehensive understanding of the biology of disease. Comprehensive understanding about spread pathways provides assistance to recognize sectors subsidizing to the cost of disease and is critical for decisive productive efforts involves for break of the disease phase. Zoonosis management is exceptional in that actual involvements may lie external to the health area because diffusion frequently does not occurs among human beings, but merely from animals to human alike in brucellosis or rabies (Zinsstag et al., 2005a, 2009b). A "one health" method validates closer support among human beings and animal health subsequent in welfares that are not accomplished along the 2 remedies working individually. "Single health" progressed from "single medication," a word devised by veterinarian epidemiologist Calvin Schwabe in the 1960s to determine that around is no example change among human beings and veterinary drugs, therefore, permitting for combined effort (Schwabe, 1984). Up to the present time, there have been inadequate determination to unify studies seeing both the public and biological structures, though this method is not theoretically novel but have been effectively pragmatic in an "ecological method to health" or "biological-health" (Forget and Lebel, 2001). It is recommend that such a method has massive prospect to increase community and animal wellbeing and deliver cost decrease in the community and privatized enterprise (Schelling et al., 2003; Zinsstag et al., 2009b). Evaluating the cost of zoonosis in various areas enables recognition of cost-distribution possibilities for example a discrete cost system. Though brucellosis management by cattle mass vaccination is not budget-operative from a community health sector viewpoint, it develops extremely cost-effective when costs are shared among the public health and agrarian areas in amount to their welfare (Roth et al., 2003). Incorporated valuations are hence vital for zoonotic disease management in reserves deprived countries (Zinsstag et al., 2007). The objective of the structure is to connect the examination outputs of animals and humans disease diffusion prototypes, financial influence prototypes, and assessment of risk managing options as an applied tool to gain improved understanding of aspects disturbing the adoption of risk managing policies so that investment design includes the most encouraging involvements in an integrated fashion.

CONCLUSION

The foundation on which to shape the worldwide pandemic inhibition strategy has transformed

significantly over the past few years. After studying different research papers, it is concluded that in developing countries, loop holes such as poorly developed health, surveillance, and control system are the main reasons for the emergence of diseases and its spread. It is demand of time to invest at massive scale on health system to cope with future pandemics. Furthermore as a community it's our responsibility to take momentous steps to control upcoming pandemics by timely investigating health and surveillance system and developing mass level awareness among people.

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Pasteurization Effects on Drinking Yogurt Quality Containing Aloe Vera Gel Extract and Strawberry Pulp

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ABSTRACT: *Popularity of drinking yogurts is increasing due to significant health benefits, on the go lifestyle and unique valuable ingredients. For the production of drinking yogurt, the present study was being carried out. Effect of various times and temperatures of pasteurization was studied in respect of stability of the product as well as concentration of Aloe Vera gel extract and strawberry pulp was being optimized. A varying heating times and different temperatures of pasteurization (70oC, 80oC, 90oC and 100oC for 5 and 10 minutes) were used in this process. With the storage at refrigeration temperature, evaluation of product for various attributes was carried out including physicochemical (pH, total solids, acidity and viscosity), microbiological (total plate count) and sensory. Effect of storage, time and temperature was seen on yogurt pH that decreased during storage while DY100/10 showed minimum decrease (0.39). Whereas, significant increase was observed in acidity during storage, as DY100/10 showed minimum increase (0.17) while reduction in viscosity was observed and DY100/10 showed minimum reduction (46.33). DY70/5 showed the maximum reduction in viscosity (50) and highest increase in acidity (0.22). During storage, non-significant increase in total solids was seen while DY100/10 showed maximum increase (0.3). Increase in storage time led to the decrease in number of total plate count and the sensory attributes (appearance, flavor, sensory acidity, body and texture) were affected significantly. During 20 days of storage, maximum scores were awarded to DY100/10 while minimum scores were obtained by DY70/5. From the present investigation it can be concluded that the best drinking yogurt with respect to shelf life and its sensory acceptance is DY100/10 with a storage period of 20 days.*

Keywords: *Drinking yogurt, Strawberry pulp, Aloe Vera, Pasteurization*

INTRODUCTION

Many high- and low-income countries are effectively contributing towards overcoming micronutrient deficiencies by producing fortified products especially dairy products (Yeh et al., 2017, Itkonen et al., 2018) Ever-growing preferences of consumers for not only nutritious and natural food ingredients but also convenience in usage has triggered the progress in fortified foods and functional beverages. Now days, consumers prefer the foods that encourage good health by preventing disease. Moreover, these foods must be economical, refreshing and fit into present-day lifestyles (Chandan, 2006). Cultured milk products such as cultured butter milk, creams, and yogurts are making the second popular fermentation industry. Yogurt, because of its health benefits, is among the most consumed fermented milk products worldwide. (Oroian et al., 2011). For yogurt preparation. Lactobacillus bulgaricus and Streptococcus thermophilus are commonly used starter culture (Younus et al., 2002). The health benefits of yogurts are greatly varied with type and viability of the starter culture (Miller, 2008). It is not only a healthier and quick snack, but it also adds years to life by supplying numerous proteins, vitamins and protein allergies (Kolarset, 2004). Moreover yogurt being anti-inflammatory, anti-mutagenic and anti-carcinogenic is a complete health package (Agarwal, 2009).

In recent years, drinking yogurt is the quickest emerging beverage picked up by consumers. This is a stirred liquid, less viscos and supply all health benefits (Thompson et al., 2007). Production techniques and savor of the final drinking yogurt products vary significantly worldwide (Kocak and Avsar, 2010). In Balkans, Anatolia, Central Asia and the Middle East, it is used simply just adding salt while fruit additives and flavors are trendier among people of UK and US. (Lee et al., 2003). The frequent consumption of such products raises high density lipoprotein, boosts our immunity, lowers body fat and lowers low density lipoprotein, increases the body's ability of bone development and protect against ulcers (Gill et al., 2001; Wang et al., 2004; Fabian and Elmadfa, 2006).

The practice to use various fruit-flavors in yogurt manufacturing has increased yogurt choices for buyer. (Erdogan and Zekai, 2003). Regular consumption of vegetables and fruits is recommended by World Health Organization i.e. at least 400 g/day (WHO, 2005).

The strawberry (Fragaria ananassa, Duch.), is a kind of fruit belongs to Rosaceae family. This fruit is rich in antioxidant micronutrients i.e. ascorbic acid and folic acid and antioxidant polyphenols such as phenolic acids, flavonoids and tannins (Seeram et al., 2006; Pinto et al., 2010). The vitamin C content is significantly high i.e. 60 mg/100 g that is dependent on cultivation conditions (Bardonaba and Terry, 2010; Kawanobu et al., 2010). However, it is extensively used in yogurt flavor and most liked by consumers than the other fruit flavors

(Thompson et al., 2007).

Plants are the source of therapeutic agents with minor side effects since time immemorial. Aloe Vera is used as a natural therapeutic agent because of its various bioactive components. Out of 250 species of Aloe Vera only two species i.e. Aloe aborescens and barbadensis are grown for commercial point of view (Cock, 2008). Aloin, is an important component of this plant used as a laxative agent and common in use for the pharmaceutical products. Gel of this plant produced healing effects and also used for manufacturing of nutritional drinks. It contains multi-vitamins proteins, minerals, polysaccharides and life stimulators. It also has growth inhibitory capacity for Gram-positive bacteria i.e. Shigella flexneri and Streptococcus progenies. Seven out of the eight essential amino acids are present in Aloe Vera gel (Rajeswari et al., 2012).

Aloe Vera gel containing a lot of anti-properties so can be used against viruses, inflammation, bacterias,tumors and fungus. Due to these properties the plant has gained much popularity in pharmaceutical, cosmtic and food industries. (Djeraba and Quere 2000, Choi and Chung, 2003, Eshun and He 2004, Boudreau and Beland 2006, Maenthaisong et al., 2007, Surjushe et al., 2008; Alemdar and Agaogln, 2009, Yu et al., 2009).

Considering the therapeutic significance of yogurt and Aloe Vera, the current study was designed to investigate effect of temperature and time combinations on the quality of drinking yogurt with strawberry and Aloe Vera gel extract.

MATERIALS AND METHODS

All experimental work was carried out at Dairy Laboratory, National Institute of Food Science and Technology (NIFSAT), University of Agriculture, Faisalabad (UAF). Fresh buffalo milk was obtained from Dairy Farm of University of Agriculture Faisalabad. Yogurt starter (Nestle yogurt), sugar, maltodextrin (stabilizer) and strawberry fruit were purchased from local market. Aloe Vera was obtained from university fields.

Crude fat, acidity, pH, total solids, ash and crude protein were analyzed in milk sample and respective methodology of AOAC (2000) was followed. All the experiments were carried out in triplicates. Fine pulp of fresh strawberry fruit was obtained by blending fresh, cleaned fruits. Aloe Vera gel extract was picked up as the inner gel spitted out from the leaf and homogenized by blending and then filtered.

Suitable quantities of sugar (10g), Aloe Vera gel extract (3 mL), Mltodextrin (0.5 %), strawberry pulp (10g), and that of water and yogurt (100 mL) were optimized for manufacturing a high quality drinking yogurt. Best treatment regarding texture, flavor, and overall acceptance was selected after sensory evaluation.

Milk was standardized to 11% SNF (Solid Not Fat) and 3% fat with pH 6.6-6.7 were homogenized to improve quality at 2.5 MPa. 0.5% maltodextrin along with milk was incubated for 5 minutes in a water bath at 90oC and then cooled at 42°C followed by inoculation with 2.5% starter. The mixture was incubated at 42°C for 3-4 hours so the 4.6pH reached. To prevent the further fermentation, immediate cooling was carried out. Finally, sugar, strawberry pulp, water and Aloe Vera gel were thoroughly mixed in a blender to get homogenous mixture. Final product was filled in sterilized glass bottles and pasteurized at different temperatures for different durations (Table 1).

Table 1: Pasteurization at different temperature and durations

Treatments	Temperature (°C)	Time (minutes)
DY70/5	70	5
DY70/10	70	10
DY80/5	80	5
DY80/10	80	10
DY90/5	90	5
DY90/10	90	10
DY100/5	100	5
DY100/10	100	10

After cooling the prepared product was kept for 20 days at 6±2?. During stowage, the product was considered for a number of analyses. The pH was determined using electronic digital type pH meter. Acidity was monitored using Titrimetric method of AOAC 947.05 (2000). Total solids were recorded by following the methods mentioned in AOAC 925.23 (2000). Microbial count was carried out following pour plate method of Dave and Shah (1996). Viscosity was measured using viscometer as described by Gassem and Frank (1991). Sensory analysis was carried out following the methodology of Nelson and Trout (1964). Complete Randomized Design (3-factor factorial) was used to analyze data R statistical design was used to calculate level of significance.

RESULTS AND DISCUSSION

According to the investigations

of El-Aziz et al. (2012) buffalo milk consists of 6.83% fat, 4.34% protein, 17.45% total solids, 0.81% ash containing the pH of 6.76. For the purpose of yogurt manufacturing, standardization of milk was carried out at a level of 3% fat and 11% SNF. By the analysis of milk it was observed that milk had 6.74 pH. The values of acidity, crude protein, crude fat, ash and total solids were 0.12, 3.80, 2.96, 0.46 and 12.74 respectively.

Physicochemical Analysis

Highly significant effect was seen of time, temperature and storage by the statistical analysis on the pH of drinking yogurt. While viscosity and titratable acidity showed significant effect of storage and temperature showed significant effect on them. Whereas, as shown in Table. 2 non-significant effect was observed of all factors on the total solids of drinking yogurt. The detailed results are discussed below.

pH:

During storage the reduction was seen in pH within all samples of drinking yogurt. A decline in pH may be due to breakdown of lactose into lactic acid. DY80/10 had undergone highest decrease in pH (0.7) while DY100/10 showed slightest change in pH which is 0.39. As shown in Fig.1 and Fig. 2, in DY80/10 minimal pasteurization temperature causes more reduction in pH and in DY100/10 elevated time and temperature combinations of pasteurization cause less variation in pH. The present study depicts the results in agreement to the findings of Joseph et al. (2011) who observed a decrease in pH as a result of lactic acid production during yogurt storage. Moreover, Kim et al. (2003), Hassan and Amjad (2010) and Kauser et al. (2011) reported the same findings of yogurt.

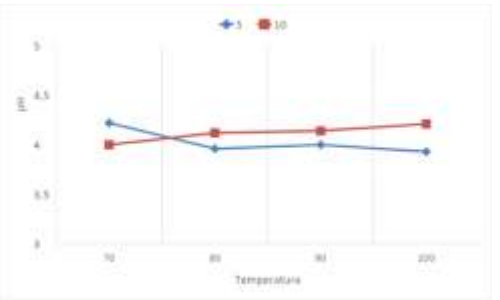

Fig. 1: The effect of various times and temperature combinations of pasteurization during the storage period of 20 days on the pH of drinking yogurt at different treatments

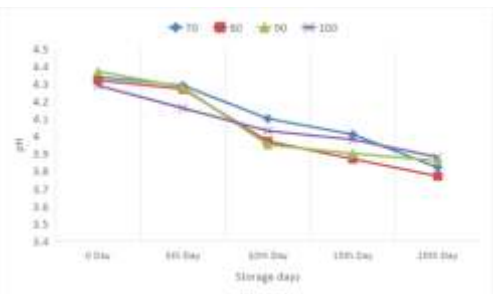

Fig. 2: The effect of days of storage and temperatures of pasteurization during the storage period of 20 days on the pH of drinking yogurt at different treatments

Acidity:

During the time period of storage

acidity increased. DY70/5 showed highest increase in acidity (0.22) while DY100/10 showed lowest increase in acidity which is 0.17. Elevated pasteurization time and temperature had significant effect on acidity as the reduction was seen on the activity of lactic acid bacteria at high temperature and an increase in activity was found at low temperature. As shown in Fig. 3, an increase in acidity was observed with the storage time due to the production of more lactic acid. During the entire storage time DY100/10 indicated the minimum increase in acidity while DY70/5 showed the maximum increase in acidity. Conversion of lactose into lactic acid followed by increase in acidity was also found in studies of Kim et al. (2003), Hassan and Amjad (2010) and Kauser et al. (2011). The study results are also in line with the previous findings.

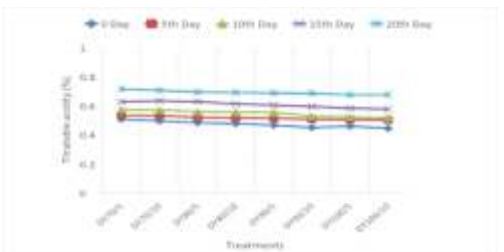

Fig. 3: The effect of various times and temperature combinations of pasteurization during the storage period of 20 days on the percent treatable acidity of drinking yogurt at different treatments

Total solids: During the entire storage time non-significant increase was occurred in total solids. DY100/10 showed highest increase (0.3) in total solids. Fig. 4 indicates the rising trend of total solids with time period of storage. As described by Hassan and Amjad (2010), due to the activity of starter culture moisture content decreased and total solids increased during storage. Increase in non-significant difference in total solids was also observed by Kavas et al. (2003).

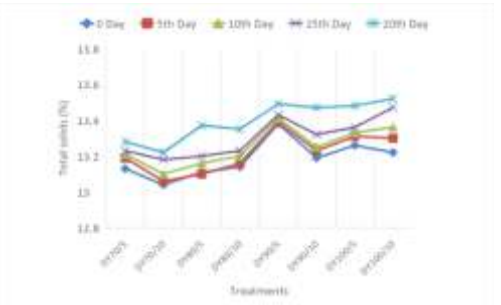

Fig. 4: The effect of various times and temperature combinations of pasteurization during the storage period of 20 days on the percent total solids of drinking yogurt at different treatments

Viscosity:

A decline in viscosity of the drinking yogurt was occurred with the passage of storage time. DY70/5 showed the maximum reduction in viscosity (50) whereas DY100/10 showed the minimum reduction in viscosity which is 46.33 during the whole time period of storage. As viscosity decrease with the rise in temperature, thus the rise in temperature caused the reduction in viscosity. With the passage of storage time, different times and temperature combinations has the effect on viscosity and make a decreasing trend as indicated in Fig. 5. The rise in the rate of whey separation and reduction in the strength of stabilizing power might be

the reason behind the reduction in viscosity. The results of the present research work was in line with the findings of Kim et al. (2003), Chandan and O'Rell, (2006) and Patel (2011).

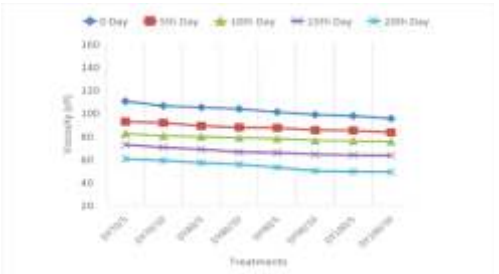

Fig. 5: The effect of various durations and temperature combinations of pasteurization during the storage period of 20 days on the viscosity of drinking yogurt at different treatments

Microbiological analysis:

At the closing stage of storage period, total plate count was significantly decreased. Fig. 6 depicts the reduction in the total plate count in all the treatments during the whole time period of storage. This phenomenon can be occurred at the closing stage of storage due to the production of lactic acid as a result of which acidity increases and pH decreases. Due to the unfavorable conditions, the activity of microbes as well as total plate count decreases. Wherever, with the increase in time and temperature of pasteurization, the number of total plate count was also increased. At 0 day DY100/10 had 5.11×108 and DY70/5 had 4.57×108 total plate count. It was gradually increased with the passage of storage time and was highest at 20th day. During the storage process, the reduction in total plate count was also observed by Allgeyer et al. (2009) and Panesar and Shinde, (2012).

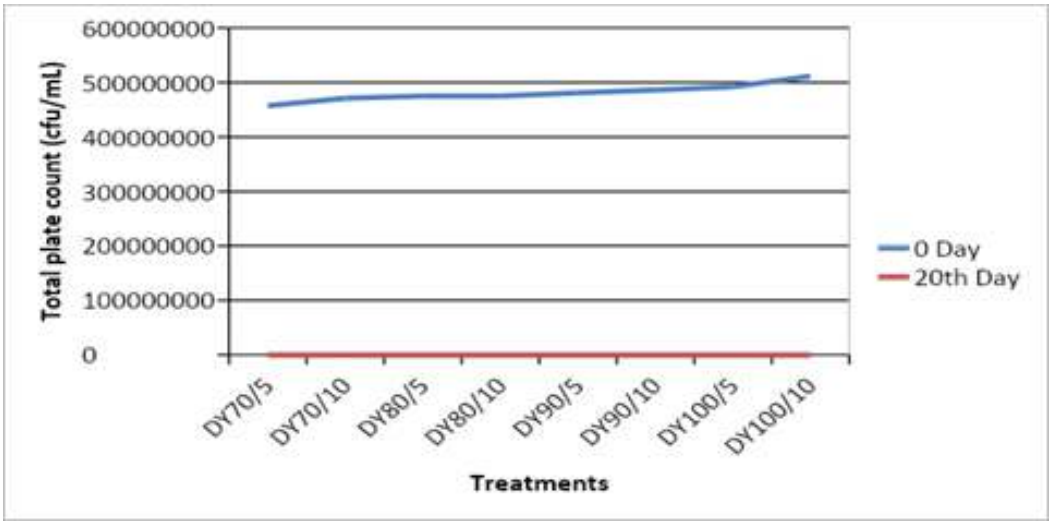

Fig. 6: The effect of various times and temperature combinations of pasteurization during the storage period of 20 days on the total plate count of drinking yogurt at different treatments

Table 2: Analysis of variance (ANOVA) for chemical analysis of the drinking yogurt

S.O.V.	d.f.	pH M.S.S	Acidity M.S.S	Viscosity M.S.S	Total Solids M.S.S
Storage	4	1.05943**	0.17323**	0.55651**	0.55651 ^{NS}
Temperature	3	0.02530**	0.01044**	0.43349**	0.43349 ^{NS}
Time	1	0.24300**	0.00149 ^{NS}	1.30250*	1.30250 ^{NS}
Storage*Temperature	12	0.01797**	0.00023 ^{NS}	0.84600 ^{NS}	0.84600 ^{NS}
Storage*Time	4	0.00141 ^{NS}	0.00007 ^{NS}	0.91981 ^{NS}	0.91981 ^{NS}
Temperature*Time	3	0.35546**	0.00007 ^{NS}	1.04974 ^{NS}	1.04974 ^{NS}
Storage*Temperature*Time	12	0.02394**	0.00006 ^{NS}	0.80921 ^{NS}	0.80921 ^{NS}
Error	80	0.00064	0.00045	0.97305	0.97305
Total	119				

*= Significant

**= Highly Significant

^{NS}= Non-Significant

SENSORY ANALYSIS

Sensory analysis of drinking yogurt was done by a jury consisting of five judges. These include the selective students and staff members of the National Institute of Food Science and Technology, University of Agriculture, Faisalabad. With reference to the prescribed methods of Nelson and Trout (1964), all judges were skilled for the sensory evaluation of all attributes of yogurt i.e. body and texture, sensory acidity, flavor and appearance. Highly significant effect of storage was seen on the appearance, flavor, sensory acidity and body and texture, whereas significant effect of temperature was observed on all these attributes as shown in Table. 3.

Table 3: Analysis of variance for sensory analysis of drinking yogurt

S.O.V.	d.f.	Sensory acidity M.S.S.	Appearance M.S.S.	Body and texture	Flavor M.S.S.
Storage	4	86.0456**	86.7067**	344.620**	259.430**
Temperature	3	2.5833*	2.7511*	7.218*	6.933*
Time	1	0.6050^{NS}	0.4812^{NS}	1.125^{NS}	1.620^{NS}
Storage*Temperature	12	0.1698^{NS}	0.1300^{NS}	0.477^{NS}	0.550^{NS}
Storage*Time	4	0.0394^{NS}	0.0709^{NS}	0.075^{NS}	0.120^{NS}
Temperature*Time	3	0.0017^{NS}	0.0022^{NS}	0.005^{NS}	0.020^{NS}
Storage*Temperature*Time	12	0.0069^{NS}	0.0136^{NS}	0.005^{NS}	0.020^{NS}
Error	160	0.9450	0.9247	2.690	1.748
Total	199				

*= Significant

**= Highly Significant

^{NS}= Non-Significant

Sensory Acidity

All the treatments indicated the reduction in scores with the passage of time during the rating of the sensory acidity. An increase in the lactic acid production can be a cause of the rise in sensory acidity. At the end of storage time (20 days) DY100/10 scored maximum points that are from 8 to 4.8 whereas DY70/5 scored minimum points (from 8 to 4). Fig. 7 indicates the results for sensory acidity in which the effect of various times and temperature combinations is depicted during 20 days of storage on the sensory acidity of the drinking yogurt. A reduction in scores of sensory acidity was also observed by Allgeyer (2009) and Cakmakci et al. (2012) during storage period and our present study findings are in co-ordinance with these reports as well.

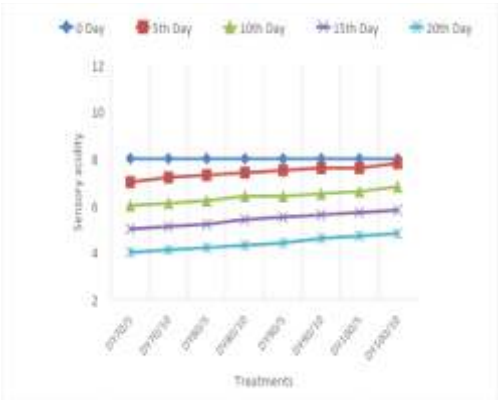

Fig. 7: The effect of various times and temperature combinations of pasteurization during the storage duration of 20 days on the sensory acidity of drinking yogurt at different treatments

Appearance

In context of the appearance, with the passage of storage period, DY100/10 scored highest points i.e. from 7 to 3.8 whereas DY70/5 scored lowest points i.e. from 7 to 3. On the other hand, an increase in appearance points was seen with increase in various times and temperature combinations of pasteurization as indicated in Fig. 8. Quality of the yogurt was deteriorated during storage as the appearance did not meet the said standards. Salwa et al. (2003) reported that during storage of yogurt, mold and yeast count rises that can destroy the quality of appearance. Same results were found by Tarakci and Kuckoner (2003) and Hanif et al. (2012) during yogurt storage.

Body and Texture

During the storage period, reduction in scoring points for body and texture was observed in the product. From 0 day to 20th day, DY70/5 showed the maximum reduction in scoring points which is 8 points whereas DY100/10 showed the minimum reduction i.e. 6.6 points as indicated in Fig. 9. Irrespective of the 0 day points, an increase in scoring points was also observed with the increase in different times and temperature combinations of pasteurization. The findings of the present study are supporting the results reported by El-Owni and Mahgoub (2012) and Hanif et al. (2012).

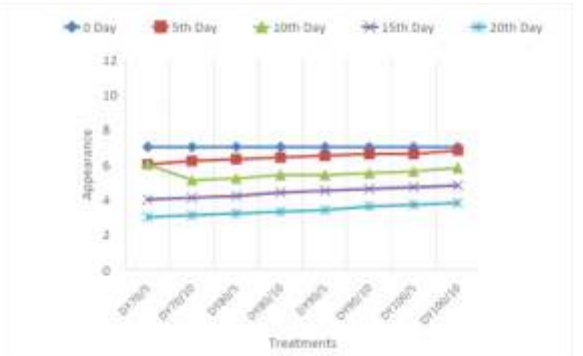

Fig. 8: The effect of various time durations and temperature combinations of pasteurization during the storage period of 20 days on the appearance of drinking yogurt at different treatments

Flavor

During storage the attribute of flavor showed the reduction in scoring points of the product. Fig. 10 indicates a gradual declining trend of storage means. DY70/5 showed the highest reduction in flavor i.e. 7 points whereas DY100/10 showed the lowest

reduction in flavor i.e. 6 points. Irrespective of the 0 day points, an increase in the scores was observed with the increase in different times and temperature combinations of pasteurization in all the treatments. During cold storage, Ekinci and Gurel (2008), Fadela et al. (2009) and Radi et al. (2009) observed the reduction in the levels of carbonyl compounds and agreed the results with the present findings.

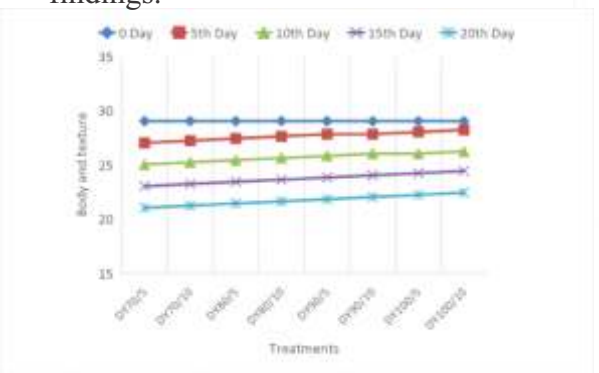

Fig. 9: The effect of various time and temperature combinations of pasteurization during the storage period of 20 days on drinking yogurt quality at different treatments

Flavor

During storage the attribute of flavor showed the reduction in scoring points of the product. Fig. 10 indicates a gradual declining trend of storage means. DY70/5 showed the highest reduction in flavor i.e. 7 points whereas DY100/10 showed the lowest reduction in flavor i.e. 6 points. Irrespective of the 0 day points, an increase in the scores was observed with the increase in different times and temperature combinations of pasteurization in all the treatments. During cold storage, Ekinci and Gurel (2008), Fadela et al. (2009) and Radi et al. (2009) observed the reduction in the levels of carbonyl compounds and agreed the results with the present findings.

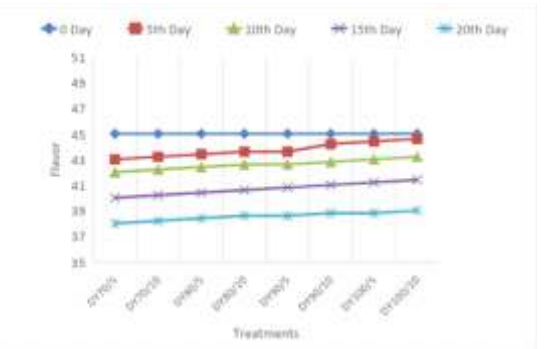

Fig. 10: The effect of various times and temperature combinations of pasteurization during the storage period of 20 days on the flavor of drinking yogurt at different treatments

Correlation matrix for drinking yoghurt:

Correlation matrix among different variables derived from physic-chemical analysis and sensory evaluation have been presented in Table. 4. The pH of drinking yoghurt exhibited linear relationship with viscosity, sensory acidity, appearance, texture and flavor whereas, an inverse association was observed for acidity and total solids.

Likewise, viscosity showed linear relationship with sensory acidity, appearance, texture and flavor however, this parameter exhibited an inverse relationship with titratable

acidity and total solids. Moreover, titratable acidity delineated positive relationship with total solids and negative association was observed with rest of the variables. It has been observed that the value for total solids had negative association with sensory acidity, appearance, texture and flavor. Similarly, sensory acidity exhibited positive relationship with appearance, texture and flavor. A linear association was observed for texture and flavor as a function of appearance. Texture of drinking yoghurt also delineated positive relationship with flavor.

Table 4: Correlation matrix among different variables derived from physic-chemical analysis and sensory evaluation

	pH	Viscosity	Titratable acidity	Total solids	Sensory acidity	Appearance	Texture	Flavor
pH	1.00							
Viscosity	0.80	1.00						
Titratable acidity	-0.79	-0.87	1.00					
Total solids	-0.42	-0.68	0.39	1.00				
Sensory acidity	0.81	0.92	-0.98	-0.48	1.00			
Appearance	0.82	0.93	-0.97	-0.48	0.99	1.00		
Texture	0.81	0.94	-0.98	-0.49	0.99	0.99	1.00	
Flavor	0.68	0.93	-0.98	-0.49	0.99	0.98	0.99	1.00

Aloe vera has been reported to be used in Chinese and Ayurvedic herbal medicines for the treatment of haemorrhoids, dermatologic problems, wounds, constipation, eczema, psoriasis and as digestive system protective herb (Panahi et al., 2015). Sánchez et al., 2020 has studied the clinical properties of various metabolite of Aloe Vera on different conditions and pathologies of human and found promising results. Therefore, considering the individual health benefits of Aloe Vera and yogurt, a food product of their combination and addition of antioxidants rich fruit i.e. strawberry makes it a healthier food product with medicinal properties.

CONCLUSION

DY100/10 awarded maximum scores with respect to the sensory acceptance. In addition, an improved quality drinking yogurt could have high storage life of 20 days especially at refrigeration temperature. Furthermore, good aroma, a smaller amount of whey separation, pleasing taste and improved appearance can be achieved by treating the drinking yogurt at 100ºC for 10 minutes. Thus, the current study has revealed the best physical parameters for storage of drinking yogurt i.e. temperature, pH and duration, keeping its nutritional value and quality maintained. Moreover, combination of fruits having good aroma and taste e.g. strawberry, mangoes and others along with Aloe Vera makes it more appealing for kids and adults as well. Use of natural ingredients for wellbeing of human can lead to reduction in many health deteriorating factors.

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Prevalence of Endometritis in Crossbred cows at District Lahore, Pakistan

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ABSTRACT: *Endometritis is causing great economic losses every year not only because of medication but also because of prolonged and increased calving period. The studies on prevalence / incidence are scarce which otherwise are essentially required to develop different control and treatment strategies. The objectives of this study was to determine incidence / prevalence of endometritis with regards to milking status and Month / Season wise in crossbred cows. The study was conducted on the crossbred cows belonging to four dairy farms located at Lahore and surrounding areas. Young stock cows fit for breeding (2-4 years old), adult milking cows and adult non milking (dry) cows were three understudy groups. Four hundred animals of each group were examined every month for a period of one year. Endometritis cases were identified through clinical signs (Less pregnancy rate / infertility, loss of appetite, depression, dehydration, vaginal discharge and dullness), Vaginal/uterine swab, colour and odour of vaginal discharge and measurement of cervical diameter. Overall Endometritis incidence was found highest (1.72 %) in Milking cows followed by Dry Cows (1.00 %) and lowest in Young Stock Cows (0.94 %). The highest incidence was observed during summer season in all three classes of cows whereas the lowest was during winter with the exception of in Milk group where the lowest incidence was observed during spring season. The study may provide useful information to evolve effective control measures and treatment of endometritis in crossbred cows.*

Key Words: *Endometritis, Crossbred Cows, Infertility in cows*

INTRODUCTION

Cows belong to the family bovidae (Dobson and Kamonptana, 1986) and crossbred cows are with pure bred parents of two different breeds, varieties or populations. Crosses occur within a single species (Gillah et al., 2013). Cows are important sources of food and income. Cross bred cows get mature at the age of 16 months and produce more milk while local cows

mature after 30 months and produce less milk (Afzal and Naqvi, 2004; Thrift et al., 2005; Dinka, 2012; Gillah et al., 2013; Kunbhar et al., 2015). These cows have short calving interval with more milk production. The gestation period of cows is about 285 days (Dobson and Kamonpatana, 1986).

Endometritis is one of the most common reproductive diseases in dairy cows (Akhtar et al., 2009; Dolezel et al., 2010; Mosaferi et al., 2013). It is the inflammation of uterus and the main health problem in dairy cows (Oral et al., 2009; Dolezel et al., 2010; Udhayavel et al., 2013; Galvao 2013; Mosaferi et al., 2013; Szenci, 2016). It not only effects milk yield but also decreases reproductive efficiency thereby causing economic loss. After parturition, bacterial contamination of the uterus lumen occurs (Ahmadi et al., 2007; Takamtha et al., 2013). During and after parturition, many organisms invade the birth canal and colonize the uterus. Postpartum uterine infection is one of the most important diseases in cows and due to this the calving period may get increased (Ekramil et al., 2008; Oral et al., 2009; Takamtha et al., 2013).

Clinical endometritis can be diagnosed by the presence of purulent and mucopurulent discharge in the vagina (Kaufmann, 2009). In purulent discharge 50% pus is present and mucopurulent discharge contains 50% pus and 50% mucus. (Galvao, 2011). 5-25% cows are affected by clinical endometritis at 4-6 weeks after parturition (Scheldon, 2007; Leblance, 2008). The causative agents of endometritis can be viruses, mycoplasma, Chlamydia, rickettsiae, bacteria and fungi but the most important cause of utrine infection is bacteria (Sadig, 2010; Joy and Faruk2012). Zobel (2013) studied the incidence, causes and treatment of endometritis. He took 1300 cows from which 23.07% were suffering from endometritis. The ratio of clinical endometritis was 15.31% and subclinical endometritis was 7.77%. Alam (2013) studied the incidence of endometritis and its reasons that leads to endometritis. He studied 488 animals of 197 dairy farms. The total incidence of uterine diseases was 39.4%, positive calving anestrus was 8.6%, delay puberty was recorded 6.8%, repeat breeds were 5.7%, retained placenta rate was 4.7%, metritis 3.9%, dystocia 3.3%, vaginal prolapse 2.7%, abortion 2.1% and uterine prolapse was 1.6%. A study on cows with metritis was conducted at northeast China from March 2012 to August 2012. They observed 1370 animals in northeast china. Sample of vagina discharge were collected and examined. Prevalence of endometritis was 17.4% (Liu et al., 2013). Lablance et al. (2002) described the signs and symptoms of endometritis. Calving period is increased, vaginal discharge increases, color and odour of vaginal discharge is changed. Signs and symptoms of endometritis include fever, pelvic pain and discomfort when having a bowl movement (French and Smail, 2004). Vlcek et al. (1985) investigated the bacterial species from cervico vaginal

mucus of cows and concluded that before postpartum the incidence of bacteria was very low. High yielding cows have more chances of puerperal problems than in low yielding cows, Endometritis, retained placenta and acute metritis are high risk factors they cause "acetonaemia" and cystic ovarian disease (Opsomer and Kruif, 2009). Incidence of reproductive disorders in crossbred cows is frequent like abortion, metritis, repeat breeders, anestrus, and retained placenta. Khair et al. (2013) evaluated that incidence of repeat breeders were 1.29%, anestrus 0.81%, metritis 0.34%, retained placenta 0.24% and abortion 0.20%. Kakar et al. (1997) studied incidence of reproductive diseases in crossbred cows in Baluchistan. They observed 21,493 cows. The percentage of uterine infection was the highest (47.5%) followed by anestrus (34.3%), and obstetrical problem (18.2%). First degree endometritis was the most common and hydrometra were lowest than other uterine infection. Lodhi et al. (1999) described the effects of parity and seasons on reproductive diseases. The occurrence of endometritis was highest followed by cystic ovaries, retained placenta, dystocia, genital prolapse and abortion. Calving season has a great impact on uterus. Incidence of endometritis during first week is 85 to 93% which is decreased 5-9% after 8 or 9 weeks. The incidence of endometritis in milking cows is 27% (Sarkar et al., 2016). In Pakistan studies on prevalence of endometritis in crossbred cows are rare. Therefore, study was conducted on crossbred cows held at dairy Farms Lahore for evaluating endometritis prevalence (rate of sickness) in milking, dry and young stock cows.

MATERIALS AND METHODS

For evaluation of endometritis incidence (rate of sickness) all cows were divided into three groups. Group A, Young stock cows fit for breeding (2-4 years old). Group B, Adult milking cows and Group C, Adult non milking (dry) cows. A total of 1200 cows (400 for each group) were examined at random on monthly basis to identify the cows suffering from endometritis.

Incidence of endometritis was determined with regards to class of animal and month / season wise. Following diagnostic techniques were used for isolation of cows suffering from endometritis disease as described by the method of (Takamtha et al., 2013; Opsomer, 2015 Szenci, 2016).

- Clinical signs: (Less pregnancy rate / infertility, loss of appetite, depression, dehydration, vaginal discharge and dullness).
- Vaginal/uterine swab: After taking the sample, it was transferred to lab for isolation and identification of microbes. Different biochemical test and staining techniques were performed.
- Colour and odour of vaginal discharge: Clear vaginal discharge (mucous in nature) was found in normal cows while muddy and odorous discharge was present in cows suffering from endometritis.

- Cervical diameter: Increased diameter of cervix was found cardinal finding.
- Endometrial biopsy: Tissues from endometrial were taken and examined histopathologically. Endometrial biopsy showed the inflammatory changes at cellular level as described by Bonnett et al. (1991).

The study commenced from 1 May 2017 and terminated on 30 April 2018 for a complete one year. The year was divided into four seasons i.e. winter (Nov to Feb), spring (Mar to Apr), summer (May to Aug) and autumn (Sep to Oct). During study period all cows were provided uniform managemetal conditions including feeding and watering.

RESULTS

Milking Cows: Endometritis was found to be most abundant during the months of July and lowest in November. The highest incidence of endometritis was noted during summer season and lowest in spring as shown in Fig. 1. Overall percentage was 1.75 %.

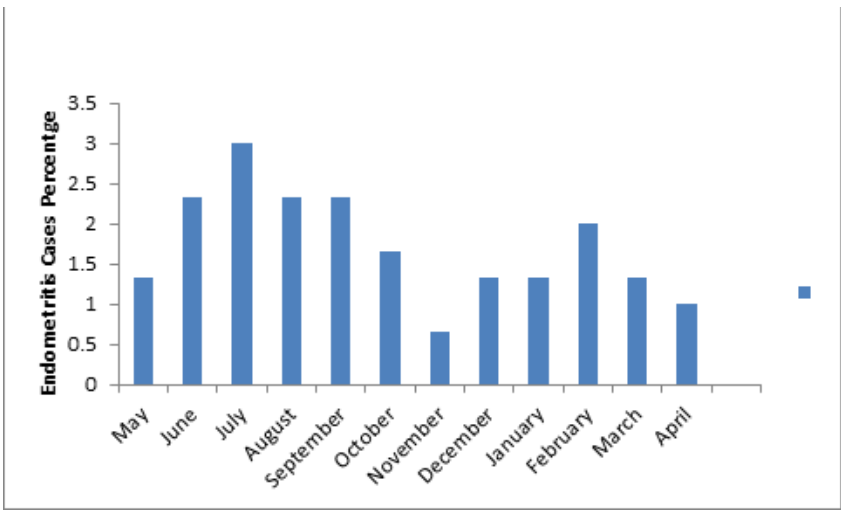

Fig. 1:Incidence percentage of endometritis in milking cows

Dry Cows: Endometritis was found to be most abundant during the months of July and lowest in December. The highest incidence of endometritis was noted during summer season and lowest in spring (Fig. 2). Overall percentage was 1.00 %

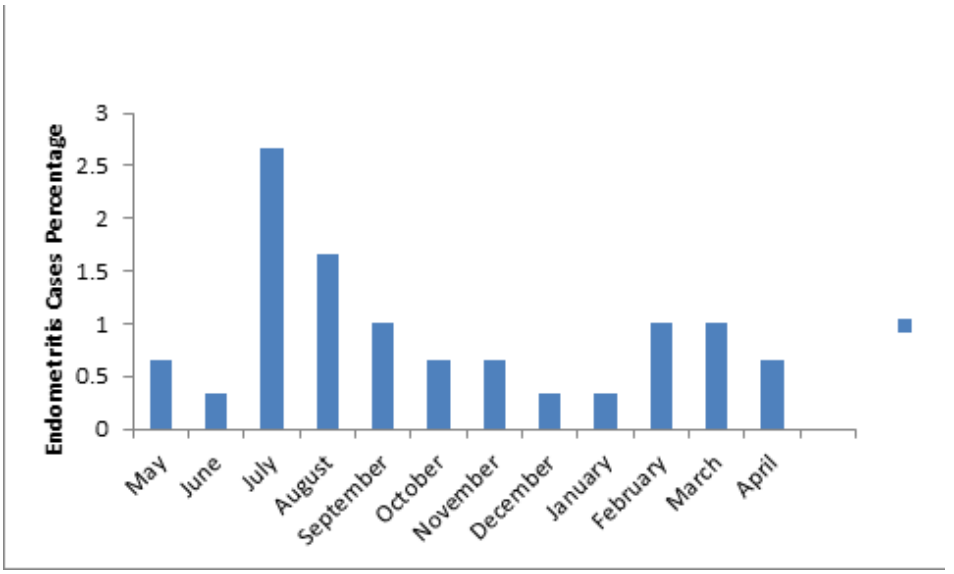

Fig 2:Incidence percentage of endometritis in Dry cows

Young Stock Cows: Endometritis was found to be most abundant during the month of July and lowest in December. The highest incidence of endometritis was noted during summer season and lowest in winter (Fig 3). Overall percentage was 0.94 %

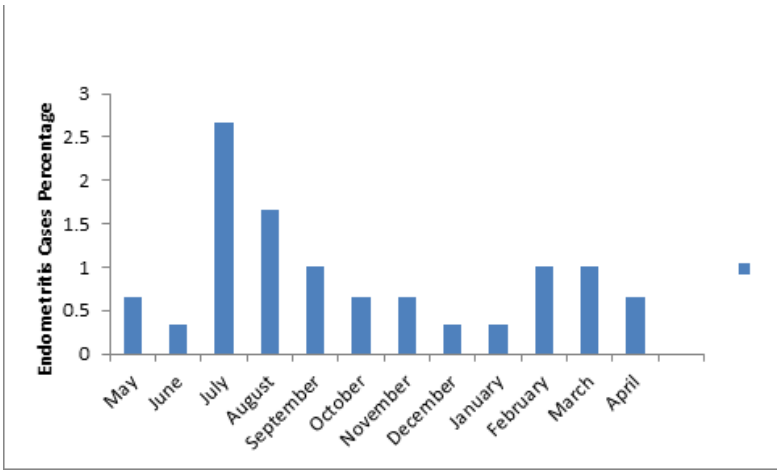

Fig. 3:Incidence percentage of endometritis in Young Stock cows

Season wise Incidence: Maximum incidence was observed in all three groups during Summer season and lowest in winter except in milk group where incidence was lowest in Spring season (Fig. 4).

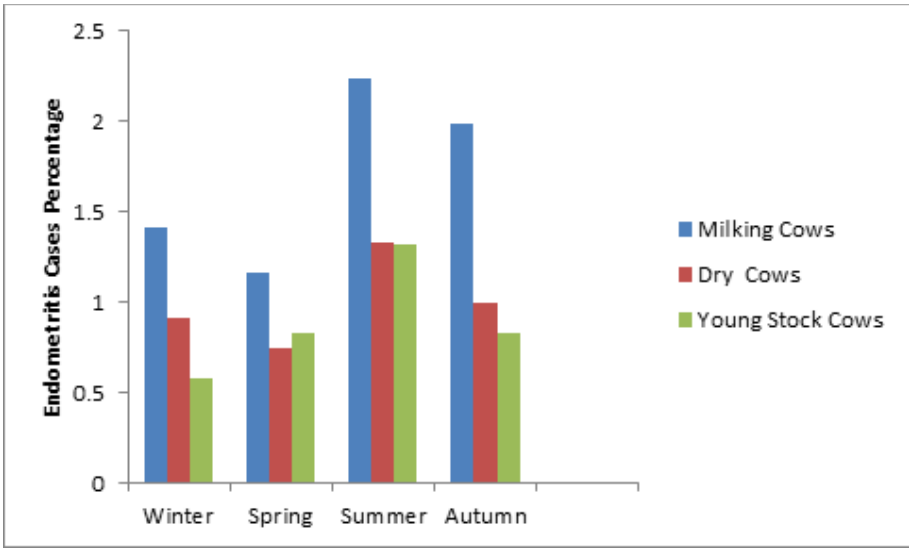

Fig. 4:Season wise Incidence percentage of endometritis in Milking, Dry and Young Stock cows

Overall Incidence: Overall endometritis incidence was found highest (1.72 %) in Milking cows followed by Dry Cows (1.00 %) and lowest in Young Stock Cows (0.94 %). The overall incidence percentage is 1.22 % (Fig. 5).

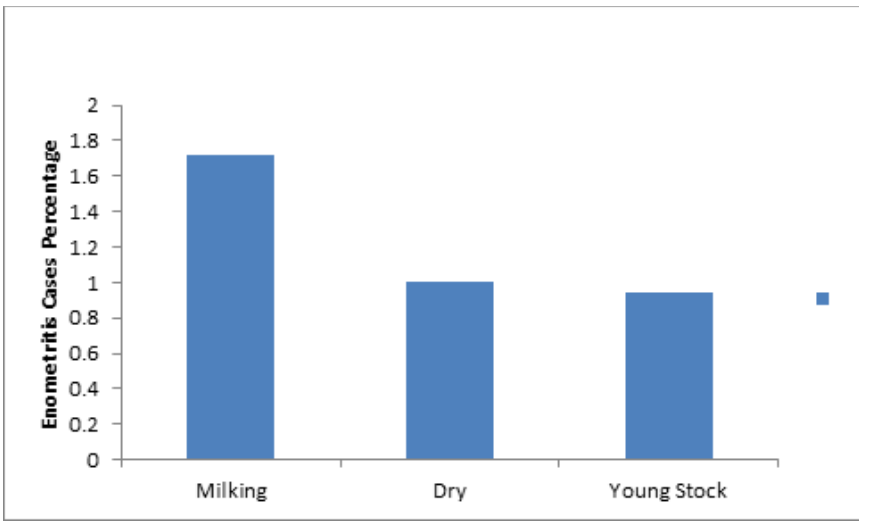

Fig. 5:Overall Incidence percentage of endometritis in Milking, Dry and Young Stock cows

DISCUSSION

Endometritis in cows is a contributing factor of infertility causing failure of pregnancy, increased calving interval and decreased milk production. This situation leads to an ultimate economic loss to farmer. We found that prevalence of endometritis was highest in summer and lowest in spring and winter seasons. We also found that prevalence of endometritis was highest in milking cows followed by dry cows and lowest in young stock cows. Current study reported overall 1.22% incidence of endometritis in crossbred cows. In present study, highest occurrence of endometritis in milking cows was recorded in summer (2.22%) followed by autumn (1.96%), winter (1.42%) and spring (1.12%). Lodhi et al. (1999) conducted study in Faisalabad. They recorded season wise incidence of endometritis during the year 1987- 1992 and found that it was maximum in summer (20.68%), autumn (17.82%), spring (13.67%) and winter (9.81%). The difference in observations of their study and present study was because of the fact that their study was conducted on all infertile cows whereas in present study we selected animals at random and only targeted endometritis cases. In our study incidence of endometritis was found to be higher in milking cows followed by dry cows and young stock cows. In summer, maximum number of cows was affected because in this season mostly cows were calved and they need to be protected against reproductive system infections by taking strict hygienic measures for standings and sheds. Infertility causes may include genetic and many acquired factors including environmental, nutritional, infectious and poor management. In the present study, highest percentage of endometritis was found in summer season, agrees with the findings of Khair et al. (2014) who reported highest incidence of endometritis as 5 % during summer in Bangladesh. In another study conducted at China Liu et al. (2013) reported 17 % endometritis cases in cows from Northeast China region. Kakar et al. (1997) studied incidence of reproductive diseases in crossbred cows in Baluchistan. They reported that incidence of endometritis was highest (52.8%) than other uterine diseases. This indicates how endometritis cases are playing maximum role towards infertility. In a study conducted at USA (Gilbert et al., 2005) found endometritis in Holstein cows diagnosed by endometrial cytology late in the voluntary waiting period was prevalent and exercised a greatly adverse effect on next reproductive performance, making it potentially extremely costly to the North American farmers. Prevalence of subclinical endometritis and its impact on reproductive performance outcomes in clinically healthy postpartum dairy cows in a pasture-based extensive dairy farming system was conducted in Argentina (Plöntzkea et al., 2010). Only cows without signs of clinical endometritis i.e. no vaginal discharge were enrolled in this study and examined for subclinical endometritis using the cytobrush technique. All cows were reexamined 14 days later

following the same examination protocol. They found that prevalence of subclinical endometritis was normal feature and decreased with increased number of days in milk and effective therapy.

CONCLUSION

In conclusion we recommend that it is imperative for researchers to conduct further studies on infectious causes of infertility in cows.

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