RESEARCH ARTICLE

BRUCELLOSIS AWARENESS AND RISK FACTORS AMONG POPULATION OF PAGHMAN DISTRICT OF KABUL PROVINCE - AFGHANISTAN.

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Manuscript Info	*Abstract*
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Zoonoses are a major health problem in Afghanistan but there is very limited data to describe the effectiveness of awareness and management of these disease particularly brucellosis. A cross-sectional study was conducted which focused on Brucellosis awareness among the residents of the targeted area specifically the people holding livestock. The study included both men and women engaged with livestock interventions and people showed the clinical picture of Brucellosis. The study population were of Paghman district in Kabul province of Afghanistan that is a rural area where majority of the residents rely on animals' rearing for their daily income and food. Population being engaged with livestock interventions was identified seeking the help of local veterinary practitioners and VFUs (Veterinary Field Units) in Paghman district. A random selection of households were applied once they were identifies as inclusive segments of this study. A total of 400 people were randomly selected to be interviewed. A structured questionnaire during face to face interviews was used for the study within the context of the study specifically focusing on Brucellosis signs and symptoms. A total of 244 male (61%) and 156 (39%) female were interviewed with outmost efforts to include equal representation and convincing community for females in the study. A major problem was in the equal selection of participants from male and female was cultural constraints at the community level given that women are not allowed to be interviewed. Substantial majorities (77%) of respondents were able to correctly answer to the knowledge of Brucellosis but specific knowledge of signs and symptoms was less consistent. Gender wise respondents' knowledge of brucellosis was higher among men (75%) than women (25%). Brucellosis transmission knowledge of respondents knowing the main routes of agent was found considerably significant since the awareness programs are running at country level. More than half of the both participants both men and women were able to describe the main routes of brucellosis. More than 90% of respondents strongly agreed with the statement that 'brucellosis occurrence can be reduced through improving public awareness'. However, only between 21.1% and 38.3% of respondents either agreed or strongly agreed that people usually do not follow professionals' advise and changing behaviors to avoid becoming infected with a zoonotic disease. The findings of this

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study support the need for on-going awareness campaigns at community level. Besides that the capacity-building of professional staff that will improve the ability of residents to safely and effectively diagnose and treat zoonotic disease cases in humans. Joint medical and veterinary approaches are recommended to identify the root cause of the disease spread and at the same time utilize the resources in an effective manner.

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Introduction:-
Afghanistan is a landlocked and multi-ethnic country situated between Central Asia and South Asia. Total population is estimated to be 32 million (KATEHON, 2016). About 57% of the population is under the age of 18 years old. According to the MICS report, 2003, the population of Afghanistan is rapidly increasing. Total fertility rate (TFR) is estimated to be 6.3 per woman. The total household size is seven. Overall population growth rate is estimated 2.4 percent per over last 24 year. However, the estimation by WHO, 2004, reports the CPR of 7.4 and annual growth rate of 3.3%.

The country has been suffering for more than thirty years of civil war and internal conflicts. During this period of time everything of the country, especially health system has been harshly damaged, particularly public and private institutions in the field of health which have vital and fundamental role in a country like Afghanistan.

Another significant consequence of 30 years of conflict and civil strife is the out migration of qualified personnel. Many qualified personnel either left the country or became the victims of war. As result Afghanistan ranks as one of the poorest countries in the world according to human development index. Health conditions in Afghanistan are among the worst in the world. The highest death rates and disability are among infants, children and mothers mostly because of communicable diseases, which could be improved through the public health care interventions such as intervention for prevention, intervention for case management and managing and improving health service delivery system.

Like other developing countries, most of the people of Afghanistan also suffer from communicable diseases. One of the most important infectious disease is Brucellosis which affect human and animal population of the country.

Brucellosis is an endemic zoonotic disease in the country (Saeed et al, 2014) especially Brucella melitensis and Brucella abortus types of the disease and the disease is found in different parts of the country (Akbarian, 2015).

Background/ Literature Review:-
Brucellosis is a zoonotic disease caused by gram negative bacteria and affects human, domestic wildlife animals (Alharbi, 2014). . It has a devastating impacts on public health, infecting around 500,000 new cases each year globally (Silva et al., 2011). The incidence of the disease is reported to be 2-8/ 1,000,000 in a global incidence report; however, according to World Organization for Animal Health (OIE) the incidence of brucellosis is 3.8 per million in the country (Saeed et al, 2014). There is no data to show the prevalence of disease in human at country level (Saeed et al, 2012) but a study which is conducted in Herat province of Afghanistan indicated that the prevalence of brucellosis in human was 15.69% based on a survey of 204 households, it shows that one in six household had a Brucella seropositive person (Akbarian et al., 2013).

There are six major species or sub-type of the Brucella pathogen such as Brucella *abortus*, Brucella *melitensis*, Brucella *suis*, Brucella *canis*, Brucella *ovis* and Brucella *neotomae* (Makita, K., et al. 2011) & (Godfroid et al, 2010) and four new brucella species have been recently isolated from different origins (Godfroid et al, 2010). At present there are ten identified species of Brucella, varying base on their host, phenotypic structure and pathogenicity. Six species among ten mentioned above are pathogenic for human which are: B. *abortus,* B. *canis*, B. *melitensis*, B. *inopinata*, B. *pinnipedialis* and B. *suis* (lopes et al, 2014) & (Silva et al, 2011).

The intensity of infection in humans rely on the strain infectious agent caused the disease. B. melitensis is considered to be the most pathogenic species of brucella following by B. *suis*, B. *abortus* and B. *canis* in descending order of severity (Woldemeskel, 2013)

It has been shown in studies that, men are at high risk of getting brucellosis than female due to their job and responsibilities. Age, sex, consumption of cream and fresh cheese which is provided from un-boiled milk can be risk factors for the diseases. In addition to that, illiteracy also has been known another risk factor for the disease, furthermore, housewives managing animal products in Afghanistan which can also be a risk factor, assisting deliveries and contact with livestock during parturition is a major risk factor for the disease; moreover, close proximity location of kitchen, being a housewife consuming un-boiled milk, participation in butchering activities and buying new animals are also considered to be associated with brucellosis infection in human (Saeed, et al, 2014).

In Afghanistan there is little official reporting data to document the scope and spread of Brucellosis in the country but annual reports from the Disease Early Warning System (DEWS) reports show a high number of outbreaks happening every year in the country as in 2011, 500 cases of brucellosis were reported in two district of Bamyan province. A study which was conducted in Bamyam province of Afghanistan reveal that butchering, buying new animals, being a housewife, and working frequently in a kitchen are important risk factors for brucellosis (Saeed et al., 2912).

Report from AHDP (Animal Health Development Project) also provided reports on brucellosis occurrence in various locations in Afghanistan. This report indicates the evidence based survey carried out jointly by Ministry of Publich (MoPH), Ministry of Agriculture, Irrigation and Livestock (MAIL) staff, AHDP consultant epidemiologist and Massey University Epi-center for ASP (Agriculture Support Program) project founded that brucellosis constantly exists different areas of Bamyan, Kabul, Kapisa, Kunduz, Baghlan and Badakhshan provinces where both human and animal cases were recorded. The report also described the FAO project entitled "Causes of Abortion" conducted under the US state department support finding the mains causes of abortion in all species. In cooperation with Animal Health Directorate (AHD) Afghanistan, samples from aborted fetuses and placenta were collected and tested under a passive surveillance program. The samples were collected during winter and spring season of 2010-2011 usually the breeding season where it was found that the main causes of abortion are Brucellosis and Q-fever (AHDP, 2013).

Rational/Justification:-
Since 2010 the government of Afghanistan under taken mass vaccination program in domestic animals but its result is not clear whether its effective or not. The Ministry of agriculture, irrigation and livestock (MAIL) in collaboration Ministry of Public Health is implementing Brucellosis control program since 2012 through animal vaccination and public awareness using mass media campaign throughout the country. The Afghanistan National Brucellosis Sero-prevalence Survey (NBSS) Result indicates that 4.2 and 2.9% Kochia flocks and village animals were respectively infected with brucellosis but follow up survey has not been conducted to check the program implementation effectiveness. There is no country level data to indicate the disease burden on human population. Although, various studies have been conducted in different part of Afghanistan indicate paradox of the disease prevalence and incidence.

In spite of a long period of the disease control program in animal in the country, the disease among human population not decrease even it has been rapidly increased from 597 cases in 2011 to 1750 in 2014(DEWS, 2015). Therefore, it is very important to conduct this study to identify public awareness and potential risk factors of Brucellosis. Moreover, the government authorities can consider alternative disease prevention and control strategy in addition to vaccination program.

In addition, in other world it has been found that, men are more likely to get brucellosis compare to women because of their jobs/occupations but in Afghanistan (Saeed, et al, 2014), most of the women are in contact of domestic animals and taking care of animals at house, therefore we want to find whether men or women are at high risk of the disease.

Study Objectives:-
- To identify Brucellosis awareness and risk factors among population of Paghman District of Kabul province – Afghanistan
- To identify potential risk factors for Brucellosis in Paghman district of Kabul province specifically in men and women.

- Based on the outcomes of the study, prepare recommendations for relevant veterinary and public health professionals regarding improvement of the awareness materials and methods both acceptable and in the context of local community.

Methods:-

A cross-sectional study design was used to implement the study. Data were collected from the people those sit under the inclusive criteria of the study in the villages of Paghman district. The data was collected using a structured questionnaire administered by trained personnel during face-to-face interviews. The project plan and questionnaire were shared with relevant authorities of the paghman district and permission was sought prior to collect the data. Community elders were involved before entrance to the villages and interviewing the participants especially the females.

1. **Inclusion criteria:** population of paghman district which are in contact with domestic animals.
2. **Exclusion criteria:** Those people who are not with contact with domestic animals.
3. **Sampling Technique:** Random selection was done after the households identified being engaged with animals' rearing, processing of products with animal origin especially raw dairy products and people with typical sign and symptoms of brucellosis. People suffering from having fever, headache, sweating, joint or muscle pain, joint swelling, fatigue, general body malaise or backache were included to the study. Risk factors e.g. contact with animals, abortion history in females, abortion in household animals, consumption of raw milk, assisting animals while giving birth, age, socio-economic status were raised as significant data collection information for the study. The households' identification was made with the help of local medical clinics and veterinary field units at district level.
4. **Sample size:** A total of 400 individuals are interviewed during study period with a percentage of 244 male (61%) and 156 (39%) female.
5. **Data Collection:** Prior to starting data collection, the questionnaire was translated to the necessary local languages and a training session on use of the questionnaire was conducted. All project members involved in data collection were trained in how to use the survey tool, how to properly record data, and made aware of how to manage issues related to client confidentiality. The training was designed to help achieve high quality data collection and improve the intra- and inter-rater reliability of the surveyors. Trainees were provided with a blank questionnaire and an interview scenario was presented by the trainers. Each trainee was asked to fill out the questionnaire based on what he heard during the scenario interview. A gold standard questionnaire was simultaneously completed by one of the trainers and at the end of each scenario; the surveys filled in by the trainees were reviewed and compared with the gold standard. The three-day training resulted in inter- and intra-rater reliability of greater than 90%. Data collection was done by a team comprised of four technical teams trained before going on the ground. All participants included in the study were randomly selected from a list of households provided by the local medical and veterinary clinics. Surveys were administered to each respondent by a pair of data collectors, each pair was comprised of one medical and one veterinary doctor. Each data collection team planned to interview as many participants as available. If the appropriate number of targeted participants planned to be interviewed on the day of a visit were not available, the data collection team returned the following day to conduct any further required interviews.
6. **Data Entry and Analysis:** All data was collected during face-to-face interviews and recorded on paper versions of the survey instrument. Once collected, the data was double-entered into Epi-Info version 7 for storage and analysis. The double entered data was then exported to Microsoft Excel to compare the two sets of data, identify and then correct any errors. Errors that were identified were cross-checked with the raw data sheets to ensure only accurate data was stored in Epi-Info. Descriptive analyses included calculation of summary measures, generating frequency tables, and creation of graphical output are used in this study.
7. **Ethical consideration:** Fist of all approval will be taken from the hospital authority. The purpose of the study will be explained to the participants and informed written and verbal consent will be obtained from the participants. They will be assured about the confidentiality and privacy.

Results:-

*1) Specific knowledge of brucellosis:*

Given the significance of brucellosis as both a human and animals' disease in Afghanistan, respondents were asked several specific questions about their knowledge of the disease. There was only modest knowledge of the key sources of exposure to the pathogen (**Error! Reference source not found.**). Respondents had better knowledge of those sources of exposure that were not likely to harbour Brucella organism than those that were likely. For

example, 88.5%, 95% CI {83.4, 92.5] knew that consumption of untreated milk or cheese was an important source of exposure to the organism but well under 50% recognized that contact with an infected animal or its excretions could also result in transmission of the organism. A majority of respondents (70.3%, 95% CI [63.6, 76.4]) incorrectly believed that consumption of meat from an infected was an important means of Brucella transmission.
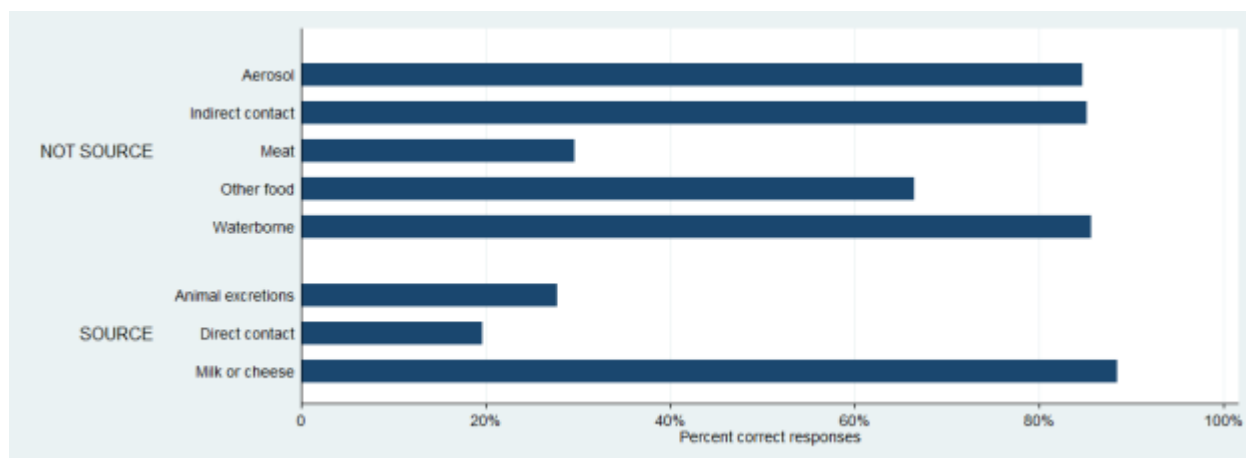
Percentage of respondents able to correctly identify sources of brucellosis infection.
Respondents were also queried as to their knowledge of typical clinical signs associated with brucellosis infection in humans. In the survey, each participant was provided with a list of 13 clinical signs, nine of which were known to commonly occur with brucellosis and four that were not, and then asked to classify each sign accordingly. A summary of the responses is shown in **Error! Reference source not found.**.
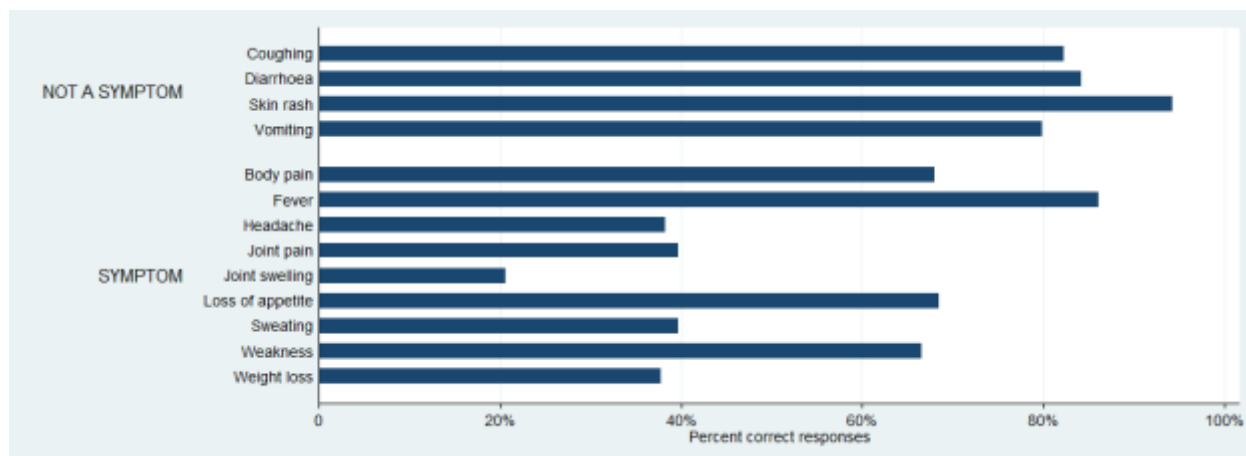

Knowledge of clinical signs typically associated with brucellosis in humans.
Respondents were generally better at ruling-out clinical signs not commonly associated with brucellosis than ruling-in important clinical signs such as joint swelling, headache, and sweating. However, participants appeared to be very familiar with some of the classical signs such as fever and generalized body pain, correctly identifying these 86.1%, 95% CI [80.7,90.5} and 67.9%, 95% CI [61.1, 74.2] of the time, respectively.

Out of 400 participants, 251 respondents knew that Brucellosis is a Zoonotic disease while 149 participants said that Brucellosis is not a Zoonotic disease.

75% of men had knowledge about Brucellosis while 25% of women had knowledge about the disease. It means that men had knowledge better knowledge than women.

**Awareness of Zoonotic Nature of Brucellosis**
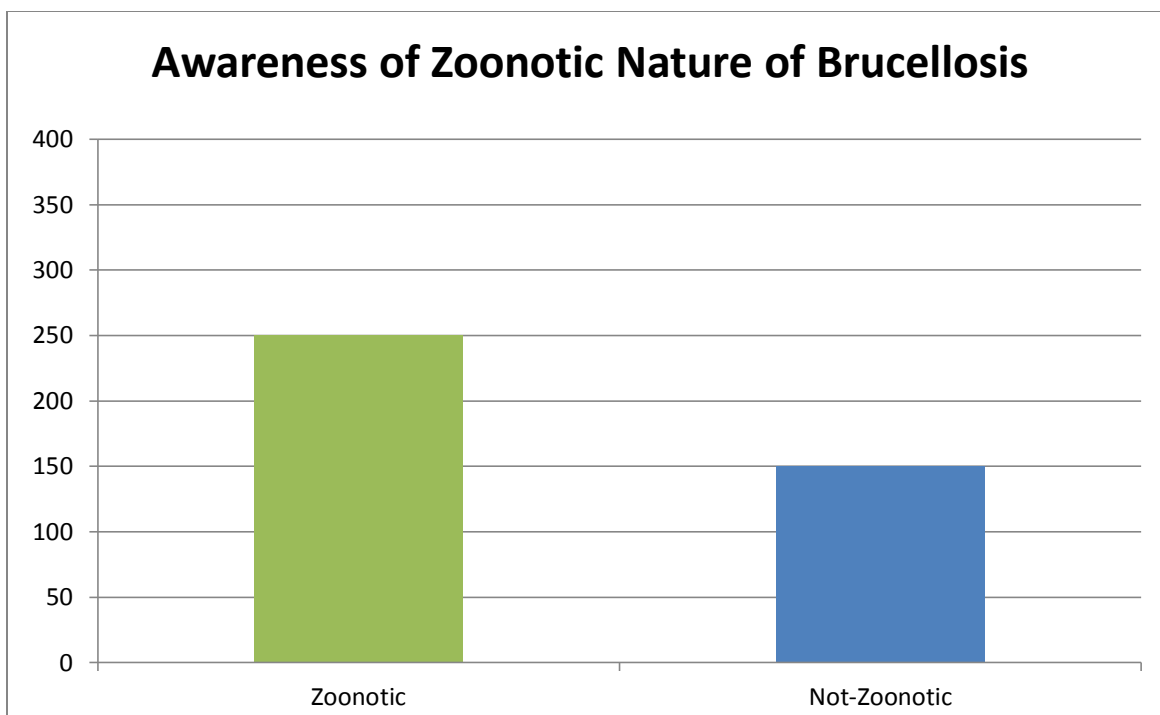
Participants' response on zoonotic nature of Brucellosis.

Most of the respondents (85%) said that raw milk consumption can be a risk factor for Brucellosis in human. 70% of the participants responded that poor sanitation can be cause of the disease. It is worth mentioning that, 35% of people did not know risk factor of the disease.
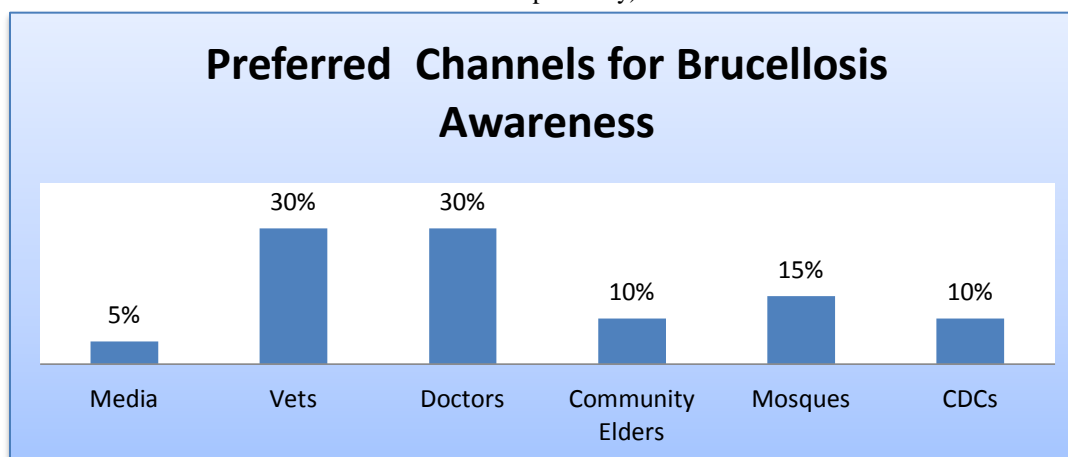
The percentage of the Risk Factors are shown in the following table:
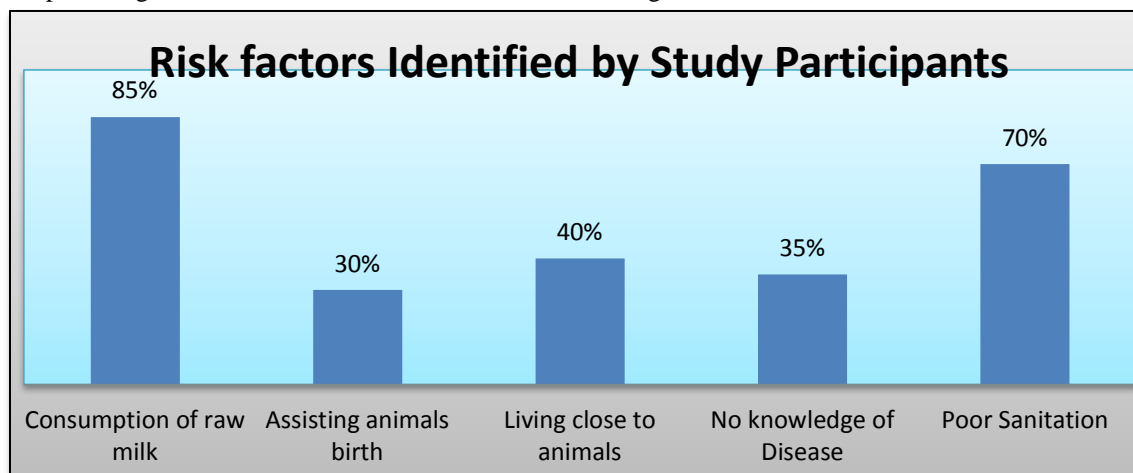
Male residents of Paghman district are more involved in livestock compare to female residents. As shown in the following pie chart that 70% males and 30% females are involved in livestock intervention.

Involvement in Livestock Interventions

■ Male   ■ Female

30%

70%
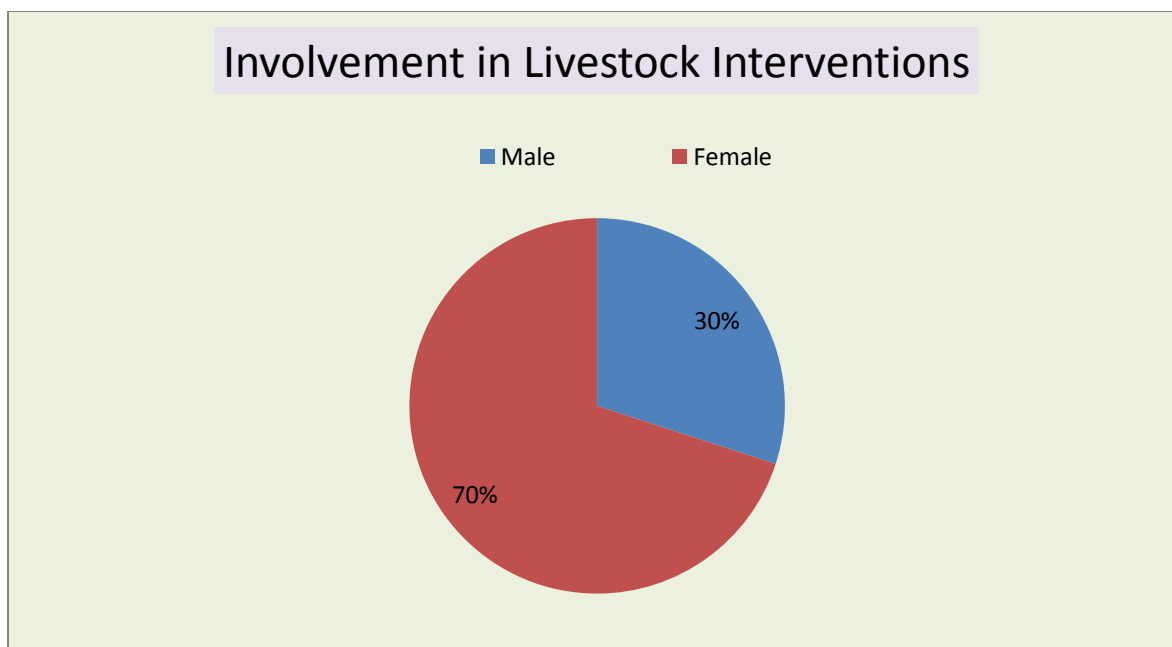
Most of the participants heard from Doctors and Veterinarian (30% and 30%) about brucellosis and less people heard from media, community elders, in the Mosque and Community Development Committee (5%, 10%, 15% and 10% respectively).

Preferred Channels for Brucellosis Awareness

| Media | Vets | Doctors | Community Elders | Mosques | CDCs |
| 5% | 30% | 30% | 10% | 15% | 10% |

DISCUSSION:-

A large proportion of the population in Afghanistan live in rural areas and rely on livestock to meet their daily needs for food and income (Olesen et al., 2005). This in turns makes the overall economy heavily dependent on maintaining a healthy livestock population as well as maintaining a well-trained and healthy workforce with agricultural skills. Minimizing the occurrence of zoonotic diseases is an important component of this national imperative.

A number of studies have been published that have identified risk factors for transmission of zoonotic infections to people. However, relatively little information is available about the topic in Afghanistan though studies have been published focusing on other parts of Central Asia and globally, often with emphasis on high profile diseases such as avian influenza, brucellosis, rabies, and others; this literature will not be reviewed here (Davlin, Lapiz, Miranda, & Murray, 2014; Lindahl, Sattorov, Boqvist, & Magnusson, 2015; Musallam, Abo-Shehada, & Guitian, 2015; Steele & Mor, 2015; Tebug et al., 2014; Xiang et al., 2010). This prior work has shed light on the behaviours that can be modified to reduce the risk of a human contracting one of these diseases. However, when zoonotic disease transmission does occur, the public health sector needs to be able to respond effectively in diagnosing and treating

the infection that results. Few previous studies have been published that have evaluated the preparedness of the public health sector in their ability to diagnose and manage zoonotic diseases; this is true for both developed and developing countries.

In a study conducted in Tanzania in 2001-2002, animal health workers (and livestock keepers) were surveyed about their knowledge of zoonoses (Swai, Schoonman, & Daborn, 2010). The health workers were found to have a higher level of knowledge about transmission pathways than livestock keepers. In particular, while both groups understood the importance of consuming animal products such as milk and meat from infected animals as important risk factors, the health workers had far better understanding of the potential for transmission to occur through direct contact with animals and their excretions. A second study in Tanzania reported in 2008 focused more directly on medical practitioner's ability to recognize and diagnose common zoonotic diseases in their patients (John, Kazwala, & Mfinanga, 2008). In the study population, there were marked differences between the level of knowledge amongst practitioners in rural versus urban areas. Urban practitioners reported better knowledge of the diagnosis and clinical signs of trypanosomiasis, anthrax, and rabies in humans, while both strata appeared to have poor knowledge of echinococcosis and bovine tuberculosis in humans. Yet another study from Tanzania conducted in 2014-2015 used quantitative and qualitative methods to assess the overall knowledge of both human health and animal health workers about priority zoonotic agents in the country, as well as their likelihood of conducting laboratory-based diagnostic tests and reporting their diagnosis to health officials (Zhang et al., 2016). Similar to the current study, these investigators reported that health workers had a high level of familiarity with brucellosis (> 90%) but substantially less awareness of other known endemic zoonoses in Tanzania including leptospirosis and Q-fever. Also similar to the current study, laboratory confirmation of suspect zoonoses cases was infrequent explained primarily by a real and perceived lack of testing capacity (depending on the disease in question) and lack of a formal clinical investigation process that would more naturally lead them to pursue diagnostic testing.

The current study aimed to create evidence upon which improvements in the Afghanistan national health strategy could be made with regard to brucellosis control. There were a high proportion of males in the study population which was largely due to the cultural constraints in the field. This could be considered as shortages of the further studi`es to enroll the most affect segment being involved with livestock interventions despite the apparent huge number of awareness campaigns in the country majority of the people could not effectively differentiate the main risk factors and the ways to avoid being infected. Behavior change is still a significant requirement for the success of reduction in Brucellosis cases at community level in Paghman district. Majority of the people still believe in old traditional usage of animal products. Study participants were particularly lacking in knowledge of transmission routes of Brucellosis especially women and this explained their unfamiliarity and lack of messages disseminated by programs running the awareness campaigns.

The study revealed that knowledge about most signs and symptoms of the disease was significantly higher amongst the participants since they were suffering those who got sick. Even though, females were found to be more engaged with livestock and processing their products but men were more aware about the disease than women. The reason could be the absence of females in the awareness campaigns due to cultural restrictions at community level. This suggests ongoing awareness programs on brucellosis with special consideration for women as the most vulnerable segment in this regard. The remote areas were totally found in ignorance of the precaution measures to avoid brucellosis infection which could of inaccessibility for the awareness programs due to security challenges.

Study outcomes and recommendations:-
Based on the study outcomes there is an urgent need to improve the level of knowledge of local community regarding brucellosis and other zoonosis. Amongst the respondents there was a generalized lack of knowledge about brucellosis transmission routes and the ways to avoid infection in their daily livestock interventions. Indeed, this was especially true for women those are found to be frontline victim being more engaged with animals and their raw products at home. Minority of the participants were happy with the awareness programs conducted till now. This provides very clear evidence of the need to provide more awareness campaigns and scenario based information to the people especially located in remote areas. Both medical doctors and veterinarians should be involved in awareness campaigns in order to reach out from both perspectives. It will certainly set goals to reduce the frequency and impact of brucellosis and other zoonotic diseases as general. Women are recommended to be trained by professional females in order to comply with local tradition and allow access to the homes and conduct training for women inside their homes.

The findings of the study strongly emphasize the need to develop zoonotic disease control and prevention policies, specifically for brucellosis. Improving capacity to manage zoonotic diseases should be approached using a One Health philosophy as most zoonotic diseases have a significant effect on both people and livestock that are infected. Organizing joint training of medical and veterinary doctors would be of vital importance as the burden of disease is shared by both populations, and both sectors have to work together to control the problem.

Developing high quality educational materials that are customized to local communities and specific to the issues and risk factors they face is important. People in the affected communities should be consulted about development of these training materials to ensure they convey useful messages and are distributed through the appropriate channels.

Acknowledgments:-

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