

## Physical, Chemical and Biological Hazards among Veterinary Health Care Workers

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### Abstract

**Background:** The veterinary health care workers are exposed to many hazards. Understanding of hazards is critical for developing strategies to ensure the health and safety of the veterinary health care workers. **Aim:** This study was conducted to assess physical, chemical, and biological hazards among veterinary health care workers. **Subjects and methods: Research design:** Descriptive research design was used in this study. **Setting:** The study was conducted in eight veterinary health care units. **Sample:** Convenience sample consisted of 64 veterinary health care workers was used in this study from previously mentioned setting. **Tools of data collection:** Structured interviewing questionnaire consisted of three parts: **Part 1** (A) Demographic characteristics of veterinary health care workers; (B) Characteristics of Veterinary health care workers; (C) past medical history of veterinary health care workers **Part 2:** Veterinary health care workers' knowledge about physical, chemical and biological hazards **Part3:** A reported practice checklist concerned with veterinary health care workers **Part4:** reported practices regarding prevention of physical, chemical and biological hazards. **Results:** The study revealed that, 78.1% of the studied veterinary health care workers had exposed to health hazards, and 37.4% of them had good knowledge score about physical, chemical, and biological hazards. Also, 68.7% of them had unsatisfactory total score practices regarding physical, chemical, and biological hazards. **Conclusion:** More than half of the studied veterinary health care workers exposed to physical hazards compared to more than two thirds of them had exposed to chemical hazards, and more than one fourth of them reported having biological hazards. About two thirds of the studied veterinary health care workers had unsatisfactory practices. There was a positive correlation between total practices score and total knowledge score of the veterinary health care workers. **Recommendations:** Health Education program for all veterinary health care workers regarding preventive measures of physical, chemical, and biological health hazards.

**Key words:** Biological hazards, chemical hazards, health Hazards, physical hazards, veterinary health care workers.

### Introduction:

Workers in the veterinary field are vital to the growth, welfare, and health of animals as well as to the improvement of the rural economy through the empowerment of socioeconomic classes. The prevention, treatment, management of animal diseases, enhancement of production, and extension efforts to implement government schemes to raise the socioeconomic class through animal husbandry activities are the primary

components of veterinary health workers' job profiles. Veterinarians appointed by the government provide veterinary care to the majority of farmers in rural areas <sup>(1)</sup>.

Physical, chemical, and biological risks are a major global public health concern; each year, 160 million work-related diseases, 2.7 million nonfatal injuries, and 2.8 billion workers are affected by these risks. An estimated 4% of the global gross national product is lost

economically because of illnesses and injuries sustained at work. The impact in poorer nations is ten to twenty times greater<sup>(2)</sup>.

By applying their scientific knowledge and technical abilities, veterinary healthcare professionals also safeguard the population from zoonotic diseases and promote public health. Veterinarians deal with a variety of sick animals and birds daily; also, some animals may look healthy but actually harbor infections. Additionally, these seemingly healthy animals run the risk of infecting veterinarians with several zoonotic illnesses<sup>(3)</sup>.

Diseases and infections known as zoonoses are spread naturally between humans and vertebrate animals. Workers in veterinary healthcare are subject to a variety of occupational health risks as a result of their line of work, including chemical, biological, psychological, and physical risks. Among the potential carcinogens that veterinarians may be exposed to are radiation, pesticides, cosmetic materials, and zoonotic illnesses like viruses. Although workers in manufacturing and construction are typically the focus of Occupational Health and Safety (OHS), infectious illnesses frequently occur in occupational settings<sup>(4)</sup>.

Veterinary healthcare professionals are particularly vulnerable to biological health risks associated with their work, particularly in nations where traditional farming practices are used, backyard livestock raising is still common, and livestock keepers have limited awareness of zoonoses. Employees in veterinary medicine are regarded as a high-risk category for workplace dangers. Around 75% of newly discovered infectious diseases in humans in Australia have some connection to animals, either directly or indirectly<sup>(5)</sup>.

Though there is a lot of research and documentation on the occupational health risks faced by veterinary healthcare professionals in developed nations, there is still a lot of similar data lacking. Decisions on improving the working conditions for veterinary professionals across the nation may be made by strategy or policymakers with a greater

grasp of other relevant aspects and a better identification of occupational hazards<sup>(6)</sup>.

**Role of Community health nurse:** As the largest group of healthcare professionals providing healthcare in the workplace, community health nurses can rise to the occasion by expanding their role and modernizing their professional education and training in order to meet these new demands. In order to safeguard and advance the health of working populations, occupational health nurses—whether they operate alone or as a member of a broader multidisciplinary team—are on the front lines<sup>(7)</sup>.

### **Significance of the study:**

The World Health Organization defines zoonotic diseases (ZD) as infections that can naturally spread from animals to people, either through a vector or not. The number of zoonotic disease outbreaks has increased over the past few decades, and these outbreaks have a significant socioeconomic impact on the world economy. For example, a single country's foodborne zoonosis outbreaks cost over \$1.3 billion yearly. Furthermore, ZD accounts for roughly 75% of newly discovered human infections and 61% of all communicable diseases that cause illness in humans. Animals or animal products have been the source of more than 75% of human illnesses<sup>(8)</sup>.

Numerous zoonotic pathogens have been identified in Egypt. Egypt has a high incidence and prevalence of zoonotic diseases, which can be ascribed to a lack of appropriate control mechanisms, poor infrastructure, and insufficient knowledge on the relevance and distribution of these diseases. Brucella became endemic in Egypt. In 2016, there was a high livestock district in the Nile Delta with a brucellosis prevalence of 7% in animals and 1.25% in humans<sup>(9)</sup>.

### **Aim of the study:**

The study aimed to assess physical, chemical, and biological hazards among veterinary health care workers.

**Research Questions:**

- What are the (physical, chemical, and biological) hazards among veterinary health care workers?
- What is the veterinary health care workers' knowledge regarding physical, chemical, and biological hazards related to work?
- What are the veterinary health care workers' reported practices regarding prevention of physical, chemical, and biological hazards related to work?
- Is there a relation between the veterinary health care workers' knowledge and their reported practices?

**Subjects and method:****Research design:**

A descriptive design with pre and post-test was used to achieve the aim of the study.

**Setting:**

The study was conducted in eight Veterinary Health Care Units out of twelve units were chosen by simple random sample from four Veterinary Administrations. These administrations were selected by cluster random sample, one Administration from each direction of the Qalubia Governorate. The investigator chose these settings because it is a big center and the rate of working there is high.

**Sampling:**

Convenience sample of veterinary health care workers was used in this study from previously mentioned setting. The total number of samples was 64 veterinary health care workers.

**Tools for Data Collection:** One tool was used to collect the data:

**Tool I:** A structured interviewing questionnaire: it was developed by the investigator based on current and past available national and international references related literature about physical, chemical, and biological hazards among veterinary health care workers using a journal, textbook, and internet search, approved by supervisors and it was written in simple clear Arabic language: it comprised of four parts.

**1<sup>st</sup> part: (A): Demographic characteristics of**

**veterinary health care workers** involved in the study; it included 4 questions such as age, sex, occupation, & place of residence.

**(B): Work characteristics of veterinary health care workers** which included 6 questions such as (number of working hours, number of working days per week, training courses, type of activities required & experience years).

**(C): Past medical history of veterinary health care workers** which included 2 questions such as (vaccinations and chronic diseases).

**2<sup>nd</sup> part: Concerned with veterinary health care workers past exposure hazards.** It contains 4 main items as physical, chemical, biological, and psychological hazards.

**3<sup>rd</sup> part:** Concerned with veterinary health care workers' knowledge about physical, chemical, and biological hazards related to working in veterinary health care units.

**Scoring system of knowledge was done as the following:** The scoring system of knowledge was calculated as follows 2 score for complete correct answer, while 1 score for incomplete correct answer, and 0 for don't know. For each question of knowledge, the score of the items was summed- up and the total divided by the number of items. These scores were converted into a percent score.

Total knowledge score was classified as the following:

- **Good** when total score was (>75%) less than 18 point.
- **Average** when the total score was (50% - 75%) between 12-<18 point.
- **Poor** when the total score was (<50%) less than 12 point.

**4<sup>th</sup> part:** Reported practice of veterinary health care workers' regarding prevention of physical, chemical and biological hazards.

**Scoring system of reported practice:** The scoring system for veterinary health care workers reported practices has 2 levels of answers: done and not done. These were respectively calculated as follow scored 1point

(done) and 0 point (not done). The score of the items were summed- up and the total divided by the number of the items, giving the mean score for the part. This score was converted into percent score. The total reported practices score was classified as following:

- **Satisfactory** when of total practice score (>60%) more than 13 point.
- **Unsatisfactory** when of total practice score (<60%) less than 13 point.

#### **Pilot study:**

A pilot study was carried out on 6 participants who represented 10% of the studied sample and were excluded from the study sample. The pilot study was aimed to assess the tool clarity and time needed to fill each sheet as well as to identify any possible obstacles that may hinder the data collection. The estimation of the time needed to fill the questionnaire; time needed to fill each sheet consumed about 30 - 40 minutes. The needed modification was done after the pilot study sample. The pilot study are excluded from the total study sample.

#### **Content Validity and Reliability:**

Content validity was conducted to determine whether the content of the tool covers the aim of the study. It measured by a jury of 5 experts, One of them professor, three assistant professors and one of them lecturer of Community health nursing at Faculty of Nursing, Benha University.

Reliability of tools was applied by investigator for testing the internal consistency of the tool, by administration of the same tools to the same subjects under similar condition ON ONE or more occasion. Overall alpha was 0.85, which is accepted and indicates good internal consistency.

#### **Field of work:**

The study was carried out over a period of three months from the beginning of December 2021 up to the end of Feb 2022. The investigator visited the veterinary units three days weekly (Saturday, Mondays, and Wednesdays) from 9 am to 1pm till covering whole 8 units. The

investigator met 6-7 workers per visit for data collection. The investigator interviewed the participants in the selected veterinary units at Benha City, after introducing himself and took their consent to be recruited in the study after explaining the aim of the study and then distributed the questionnaire sheet after clear explanations of the way to fill out and in the presence of the investigator. Each sheet took about (30-40 minutes) to answer each participant. During the interview the investigator read each item/ question on data collection sheet and explains its meaning to the participants.

#### **Administrative and Ethical considerations:**

An official letter was issued from the Dean of Faculty of Nursing, Benha University to the Director of Veterinary Medicine in Qalubeia Governorate. Concerning the title, objectives, tools and the study technique were illustrated to gain their cooperation which is needed to allow the investigator to meet veterinary health care workers in the previous mentioned setting.

The investigator introduced him-self and explained the aim of the study to the participants. All ethical issues were assured; oral consent obtained from the participants at the veterinary health units before interviewing them. Confidentiality of the information was assured through the study process where the personal data were disclosed and used only for the study purpose. Each participant was informed that participation is voluntary and the right to withdraw from study at any time without giving any rational.

#### **Statistical analysis:**

The collected data was analyzed, tabulated and presented in figures by using suitable statistical methods as number and percentage distribution by Statistical Package for Social Science (SPSS) version 21. Data were presented by using proper statistical tests that were used to determine whether there was significant relation or not and if there were positive correlation or not. P-value was used to determine significance of results as follows:

- P value >0.05 is not- statistically significant difference.

- P value <0.05 is statistically significant difference.
- P value <0.001 is highly statistically significant difference

## Results:

**Table (1):** Illustrates demographic characteristics of the studied veterinary health care workers. It shows that, 40.6% of the studied veterinary health care workers' age were 40- <50 years old with mean age  $\pm$ SD 46.41 $\pm$ 9.5 years. 70.3% were male. 32.8% of the studied veterinary health care workers were Assistant health care workers. 51.6% were living in urban areas.

**Figure (1):** Demonstrates percentage distribution of studied veterinary health care workers regarding taking vaccines of zoonotic disease. It illustrates that; 77.3% of the studied veterinary health care workers took tetanus vaccine, and 53.1% of them took rabies vaccine. While 9.4% of the studied veterinary health care workers took anthrax vaccine.

**Figure (2):** Demonstrates the distribution of the studied veterinary health care workers regarding history of chronic diseases. It shows that 46.9% of the studied veterinary health care workers suffered from back pain, while 3.1% of them suffered from hepatitis.

**Table (2):** Illustrates distribution of studied veterinary health care workers regarding their total exposure to health hazards. It shows that 57.8% of the studied veterinary health care workers were exposed to physical hazards before, compared to 68.8% of them had exposed to chemical hazards. Regarding biological hazards, 26.6% of them had reported having biological hazards, while 78.1% of them had psychological hazards.

**Figure (3):** Demonstrates distribution of studied veterinary health care workers regarding their exposure to health hazards. It clarifies that; 78.1% of the studied veterinary health care workers were exposed to health hazards, compared to 21.9% of them who did not expose to health hazards.

**Figure (4):** Illustrates percentage distribution of studied veterinary health care workers regarding their total knowledge score about physical, chemical, and biological hazards. It shows that 37.4% of the studied veterinary health care workers had good knowledge scores about physical, chemical, and biological hazards. 31.3% of them had average and poor knowledge scores.

**Figure (5):** Shows percentage distribution of studied veterinary health care workers regarding their total practices about occupational hazards. It demonstrates that 68.7% of the studied veterinary health care workers had unsatisfactory total score practices regarding physical, chemical and biological hazards, compared to 31.3% of them who had satisfactory practices.

**Table (3):** It shows the correlation between total knowledge score and total practices score of the studied veterinary health care workers. It represents that there were a positive correlation between total practices score and total knowledge score of veterinary health care workers.

## Discussion:

Veterinary health care workers are the staff who protect the health and well-being of animals. The role of veterinary health care workers is diagnosing, controlling, and treating animals' diseases with proper care and restraining. Close contact with the animals makes the veterinary health care workers susceptible to many harmful health hazards and great risk of being infected or injured. Physical, chemical, and biological hazards are very common in veterinary health care workers. Veterinary health care workers deal with small animals, wild animals, health inspection, and meat inspection. These kinds of various activities make veterinary health care workers exposed to different health hazards. Lack of knowledge about physical, chemical, and biological health hazards and safety precautions in the working environment may enhance the risk of several physical, chemical, and biological hazards<sup>(10)</sup>

This study aimed to assess physical,

chemical, and biological hazards among veterinary health care workers.

Regarding to demographic characteristics of studied veterinary health care workers, the present study showed that; Approximately two fifth of the studied veterinary health care workers were aged from 40 to less than 50 years old with mean age  $\pm$ SD 46.41 $\pm$ 9.5 years, more than two thirds of studied veterinary health care workers were male and a proximately one third worked as veterinary workers. The residence of the studied subjects was lived in rural area nearly equal the residence in urban area (table1). These results were in the same line with <sup>(11)</sup> they studied occupational health hazards among veterinary workers in Sohag (n=400), and reported that, less than two thirds (65.4%) of the studied sample age were ranged from 30 to 39 and 40 to 49 years old with the mean age 46  $\pm$  6.5 years old, more than two thirds (66.7%) of the studied subjects were male. Nearly half (49.8%) of the studied subjects lived in rural areas, and nearly half (50.2%) of them were living in urban area. On the other hand, concerning age, this result was in contrast with <sup>(12)</sup> they conducted a study on occupation related biological health hazards and infection control practices among Indian veterinarians (n=562), they illustrated that; the mean age of the veterinarians working in Gujarat and Maharashtra state was 39.41 $\pm$  9.75 years old.

Regarding taking vaccines of zoonotic disease of the studied veterinary health care workers, the current study illustrated that; more than three quarters of the studied veterinary health care workers took tetanus vaccine (figure 1). This finding was similar with <sup>(12)</sup>, they reported that about half (50.7%) of veterinarians took a tetanus vaccine.

Regarding past medical history of the studied veterinary health care workers regarding chronic diseases, the current study showed that; less than half of the studied veterinary health care workers suffered from chronic back pain (figure 2). This result was similar with <sup>(13)</sup>, they studied musculoskeletal discomfort in veterinary healthcare professions in Ohio state, USA (N=94), and they reported

that the prevalence of chronic back pain among veterinary healthcare team was three fifths (60%). Also, this findings were in the same line with <sup>(14)</sup>, they studied musculoskeletal discomfort among Canadian bovine practitioners in Canada (N=133), and they stated that more than three fifth (63%) of the practitioners were suffering from lower back pain.

Regarding total exposure of the studied veterinary health care workers to health hazards; the current study showed that, more than half of the studied veterinary health care workers exposed to physical hazards (table2). These results were in agreement with <sup>(15)</sup> they found that half (52%) of the studied sample was exposed to physical health hazards. This may be related to the inappropriate use of safety measures.

Regarding total exposure of the studied veterinary health care workers to chemical hazards; the current study revealed that; about two thirds of the veterinary health care workers had exposed to chemical hazards (table2). This finding was similar to <sup>(16)</sup>; they did a systematic review and meta-analysis of veterinary-related occupational exposures to hazards in South Africa (N=132) and they stated that more than half (52%) of the studied participants exposed to chemical hazards. This may be due to the insufficient training on the proper ways to deal with chemical substances.

Regarding total exposure of the veterinary health care workers psychological hazards, the present study revealed that; more than three quarters of the studied veterinary health care workers had reported having psychological hazards (table2). This result was in the same line with <sup>(1)</sup>, they studied risk factors and prevalence of work-related injuries and accidents among veterinarians in India (N=565), and they reported that more than half (56%) of the studied veterinary workers had psychological stress. On the other hand, this finding was disagreed with the study of <sup>(17)</sup>; they reported that only one fifth (20%) of the studied sample felt high level of psychological stress. The high level of psychological stress may be related to burden of work and lack of good communication.

Regarding total exposure of the studied veterinary health care workers to physical, chemical, and biological hazards; the current study clarified that; more than three quarters of the studied veterinary health care workers had exposed to health hazards (figure 3). These finding was in the same line with <sup>(18)</sup>, they studied occupational injuries and zoonotic disease among veterinarian in Malaysia (N=133) and they found that; about three quarters (74%) of the studied veterinarians have experienced health hazards related to the work. This may be due to the insufficient training in safety measures during dealing with the animals.

Regarding total knowledge score of the studied veterinary health care workers about physical, chemical, and biological hazards. The current study found that; more than one third of the studied veterinary health care workers had good knowledge score about physical, chemical, and biological hazards (figure 4). This result was like <sup>(19)</sup> they studied brucellosis among zoo veterinarians in India (N=193) and they reported that less than one third (31%) of studied participants had inadequate knowledge about occupational hazards. This finding was congruent with <sup>(20)</sup> they studied occupational injuries and illnesses among zoo veterinarians in the United States (N=563), and they reported that knowledge of occupational hazards was inadequate among one fourth (25%) of American zoo veterinarians. These findings agreed with <sup>(1)</sup>, they found that approximately about one third (32.9%) of the veterinarians were aware of physical hazards and less than half of them aware of biological hazards, and minority of them were aware of chemical hazards. This might be related to the insufficient training on physical, chemical and biological hazards.

Regarding total practices of the studied veterinary health care workers about occupational hazards, the current study demonstrated that; more than two thirds of the studied veterinary health care workers had unsatisfactory total score practices regarding physical, chemical, and biological hazards (figure5). This finding was like <sup>(20)</sup>, they did a study to assess knowledge, attitudes, and practices of occupational hazards among

veterinarians in Chad (N=247), and they reported that more than half (52%) of the studied sample had unsatisfactory total practice score regarding occupational hazards. On the contrary, this finding disagreed with <sup>(20)</sup>, they studied knowledge, attitudes and practices among the veterinary practitioners in Bangladesh (n=168), they found that; more than three fifth (63%) of the studied sample had satisfactory practice level regarding physical chemical and biological hazards. In my opinion this may be related to the shortage of supervision and training.

Regarding correlation between total knowledge score and total practices score of the studied veterinary health care workers, the current study exemplified that; there were positive correlation between total practices score and total knowledge score of veterinary health care workers (table 3). This finding was in the same line with <sup>(21)</sup> they studied occupational health hazards in veterinarians in India (N=253), and they declared that there was positive correlation between total practices score and total knowledge score of veterinary workers. In my opinion, theoretical knowledge enriches and affects the practices of veterinary health care workers positively.

## Conclusion

More than half of the studied veterinary health care workers exposed to physical hazards, more than two thirds of them had exposed to chemical hazards, and more than one fourth of the studied veterinary health care workers had exposed to biological hazards. More than one third of the studied veterinary health care workers had good knowledge score about physical, chemical, and biological hazards, and less than one third of them had average and poor knowledge score. About two thirds of the studied veterinary health care workers had unsatisfactory practices regarding physical, chemical, and biological hazards, compared to about one third of them who had satisfactory practices. There was positive correlation between total practices score and total knowledge score of the studied veterinary health care workers.

**Recommendations:**

In the light of the results of the present study, the following recommendations are suggested:

- Health Education of all veterinary health care workers regarding Occupational health hazards.
- Distribution of different instructional booklets and brochures for veterinary health care workers including preventive measures of physical, chemical, and biological health hazards.
- Further research needs to be focusing on improving knowledge and practices of veterinary health care workers about physical, chemical, and biological health hazards.



Table (1): Distribution of studied veterinary health care workers regarding their demographic characteristics (n=64).

Demographic Characteristics	No	%
<b>Age/years</b>		
< 30 years	8	12.5
30 - < 40years	16	25.0
40- < 50 years	26	<b>40.6</b>
≥ 50 years	14	21.9
Mean ±SD	46.41±9.5	
<b>Sex</b>		
Male	45	<b>70.3</b>
Female	19	29.7
<b>Occupation</b>		
Veterinary physician	21	29.7
Assistant health care worker	19	<b>32.8</b>
Pharmacist	7	10.9
lab technician	4	6.3
Meat inspector	13	20.3
<b>Place of residence</b>		
Urban	33	<b>51.6</b>
Rural	31	48.4

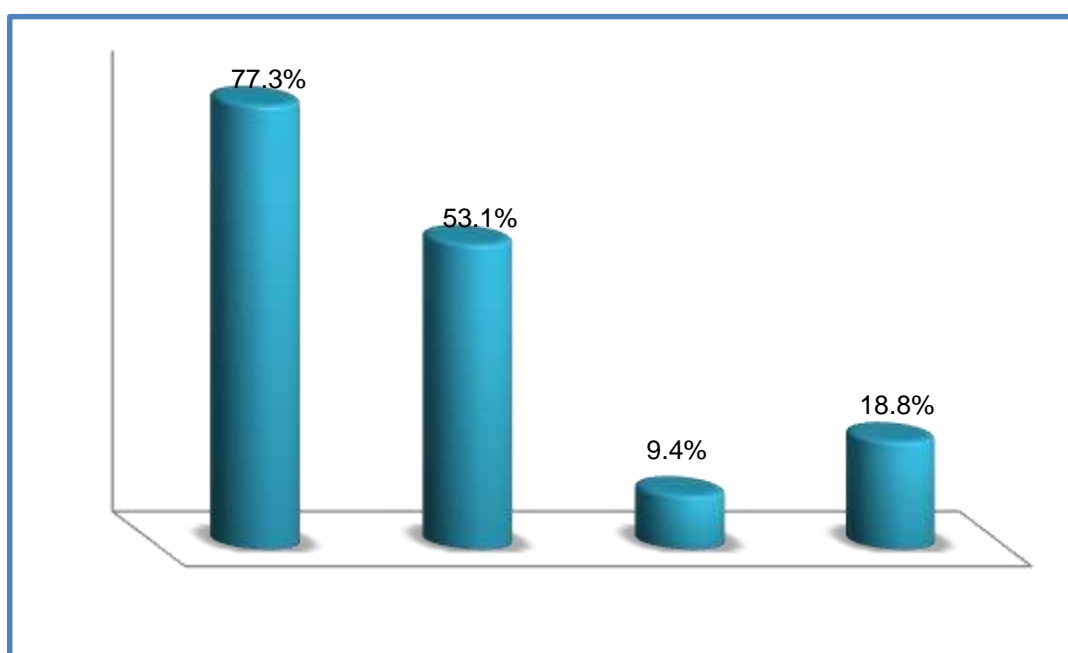


Figure (1): Percentage distribution of studied veterinary health care workers regarding taking vaccines of zoonotic disease (n=64).

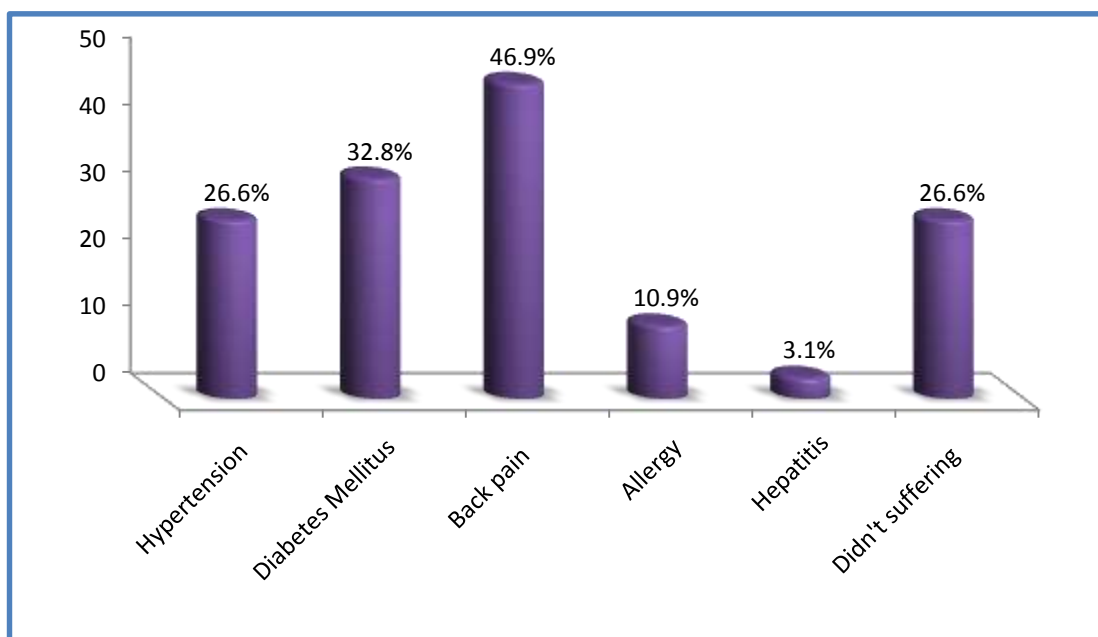


Figure (2): Percentage distribution of the studied veterinary health care workers regarding past history of chronic diseases (n=64).

Table (2): Distribution of studied veterinary health care workers regarding the total exposure to health hazards (n=64).

Exposure to health hazards	Exposed		Not exposed	
	No	%	No	%
Physical	37	57.8	27	42.2
Chemical	44	68.8	20	31.2
Biological	17	26.6	47	73.4
Psychological	50	78.1	14	21.9

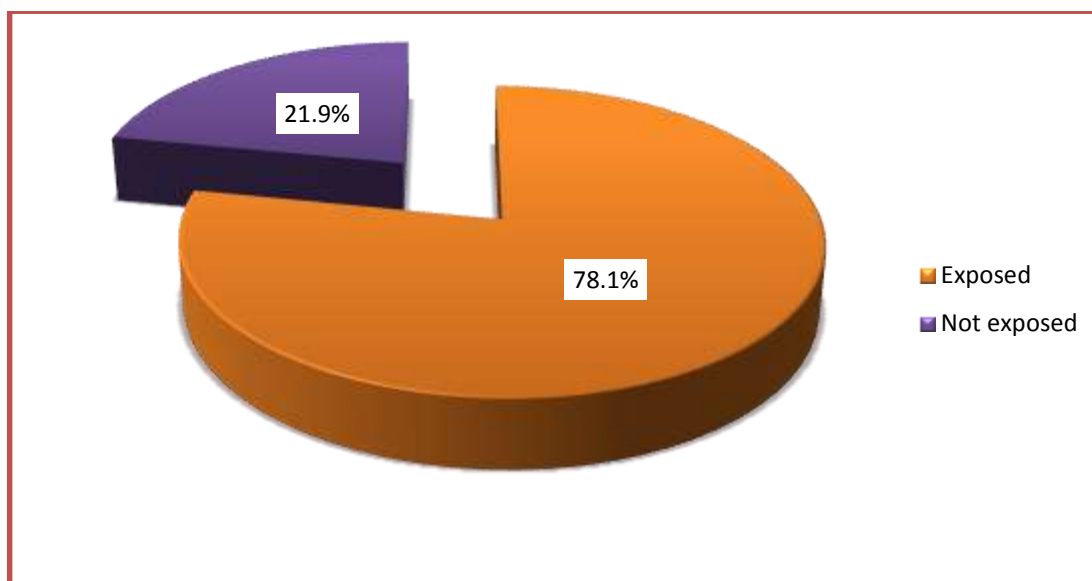


Figure (3): Distribution of studied veterinary health care workers regarding their exposure to health hazards (n=64)

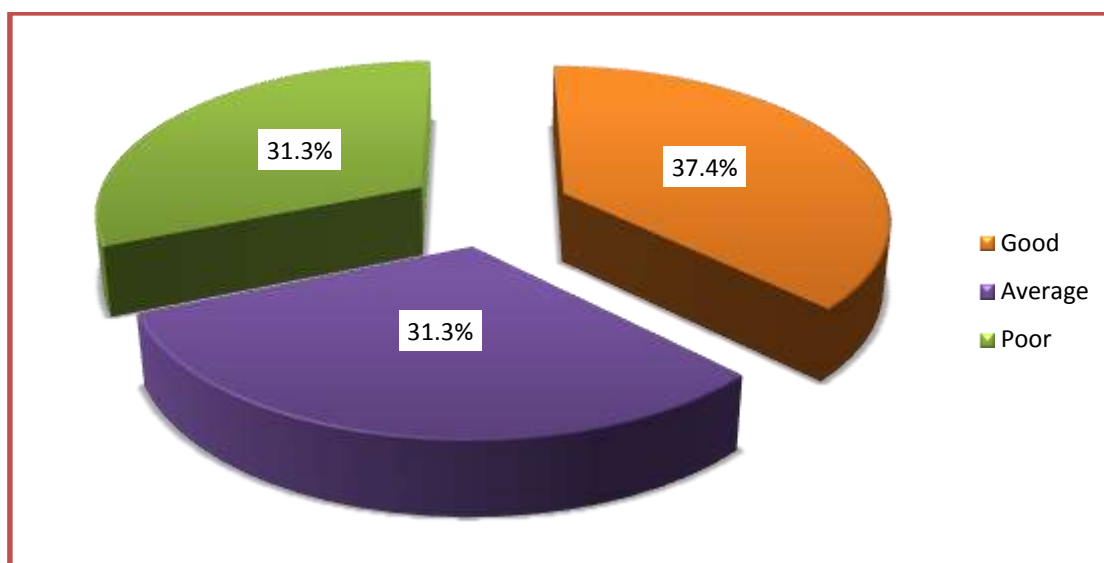


Figure (4): Percentage distribution of studied veterinary health care workers regarding their total knowledge score about physical, chemical and biological hazards (n=64).

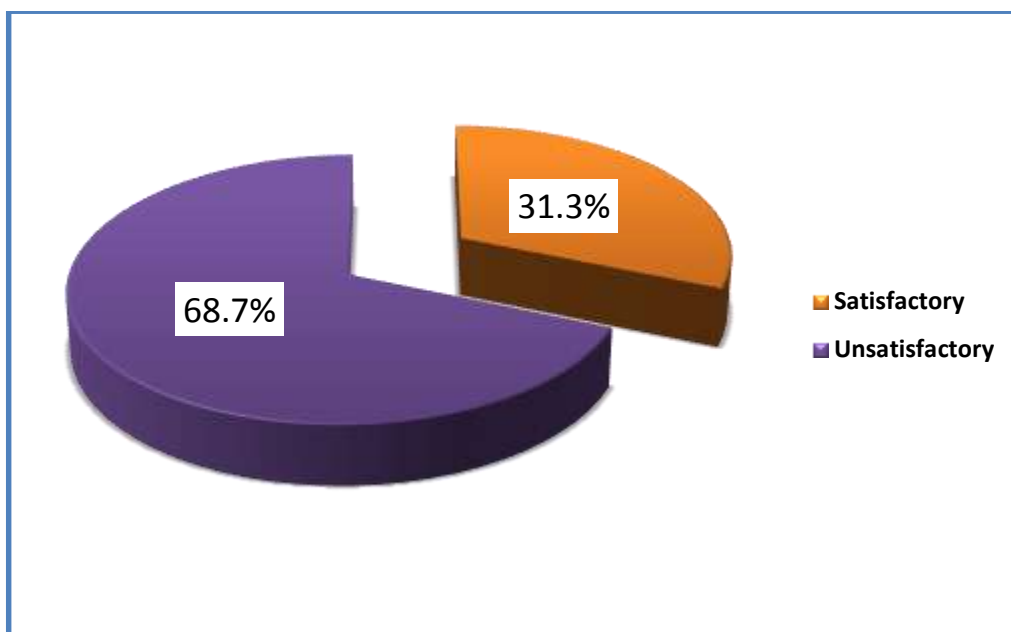


Figure (5): Percentage distribution of studied veterinary health care workers regarding their total practices about occupational hazards (n=64).

Table (3): Correlation between total knowledge score and total practices score of the studied veterinary health care workers.

Items	Total knowledge	
	r	p-value
Total practices	0.250	0.046*

\*Significant P<0.05

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