

AQUATIC ANIMAL HEALTH



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Summary

Health of aquatic animal is a concerned matter now-a-days as it is directly and indirectly related to the health of human. Aquatic animals are those animals which lives most of their life cycle in the water. Though there are several types of aquatic animals, fish is the most popular and beneficial among all of them, thus culture of this aquatic animal for human consumption is the most common. Objectives of this study is mainly to check the health status, health and disease management, survival rate of aquatic animal, mainly in fish in mix culture system.

To investigate these facts, data of 10 species of fishes about preventive and hygiene measures, disease and abnormalities, medicine for cure, mortality and survivability rate in mix culture were collected and observed. Chemicals such as disinfectant and fertilizer were mostly used for prevention and hygiene. These diseases were mainly found in fishes. Antibiotic, disinfectants and oxygen enhancer were main medicines to cure diseases. Survivability and health of some species of fishes were found better than some another species of fishes. It is concluded that, health of aquatic animals is not only a combination of pond preparation, preventive measure, disease identification, treatment, proper management, but also it is depended on type or species of fish which has been cultured together.

Key words: Aquatic, fish, health, disease.

1. Introduction

As a consequence of increased concern of health issues, demand of healthy and risk free food is rising continuously. Aquatic animals are being used for many purposes year after year for betterment of human. But most of them, especially various types of fishes have been used as vital source of food and high quality protein source majorly (Tidwell and Allan, 2001). So, it is compulsory to maintain proper health of aquatic animals to supply safe food and to fulfill the protein demand, as it has relation to public health. Like other animals, aquatic animals also be affected by many disease and deformities which occurs due to be attacked by different pathogens like virus, bacteria, fungus, parasites etc. (Ahmed et al., 2022) that keeps negative influence to their health and production (Hossain et al., 2011). To keep good health, to overcome diseases and to increase survival rate selection of fish species, regular maintenance of health and pond as well (Hossain et al., 2011), taking preventive measures (Assefa and Abunna, 2018), proper diagnosis and treatment (Terech-Majewska, 2016) are pre-requisites during aqua culture.

Since, environment of water and land (Ikeogu et al., 2010) keeps crucial effects on fish health, preparation of pond with certain amount of different chemicals is a must in fish culture (Shah et al., 2022). Lime, salt, potash, urea and TSP are being widely used for preparing pond and also to maintain hygiene thus preventing diseases. Potash by acting as disinfectant (Zhou et al., 2017), lime by balancing ph (Boyd, 2017) and salt by preventing parasitic infestation (Swann and Fitzgerald, 1992) maintains healthy environment for fish in pond. Urea and TSP contains nitrogen and phosphorus those helps to grow planktons in the pond and increase productivity of pond, thus helps to keep good health of fishes (Burtle, 2015).

Diseases of fishes can be categorized into viral, bacterial, fungal infections, parasitic infestation etc. (Axelrod and Untergasser, 1989). Argulosis, epizootic ulcerative syndrome, edwardsiellosis, columnaris, white spot disease, fin and tail rot, gill rot, chilodonella infestation, dropsy, hypoxia etc. are the most common diseases found in fish (Sharma and Pandey, 2012; Kawsar et al., 2022). However, most of the diseases are diagnosed by close observation of fishes and identification of signs and also by seeing movement of fishes, appearance of water, its color. Proper and early treatment helps to reduce mortality, increase survivability and decrease production loss.

To treat fish diseases various types of medicines such as disinfectant (e.g. potassium permanganate, lime, salt, tymsen), antibiotics(e.g. oxytetracycline, tetracycline, erythromycin), vitamins, oxygen enhancer (e.g. oxy-ren) etc. are used (Kawsar et al., 2022). These medicines kills microorganisms, destroy pathogens, increase oxygen level, thus eliminate diseases and help fish to regain normal health.

Unlike other living populations, good health of aquatic animal or fish is indicated by high survivability and low or zero mortality of that population. Some types of fishes survive more and be less attacked by disease over other types of fishes in mix culture system. Selvamani and Mahadevan (2008) stated that, combination of catla, rohu, mrigal, common carp, silver carp survives more in pond mix culture system than other species of fishes.

As it is seen that, all these factors described above are directly connected to the health of aquatic animal, maintenance and combination of these factors is mandatory to keep the health of aquatic animal up to the mark.

Therefore, the present study was conducted to see the status of management of all these factors which are specifically associated with aquatic animal health in aquaculture in root level.

2. Materials and method

2.1. Study area and duration:

A retrospective cohort study was conducted at Choto darogar hat, Bariadyala which is located at Sitakund sub-district in Chattogram, Bangladesh. Sitakund is situated at the northwestern part of Chattogram district, between 22'34'N and 22'43'N latitude and 91'38'E and 91'41'E longitude.

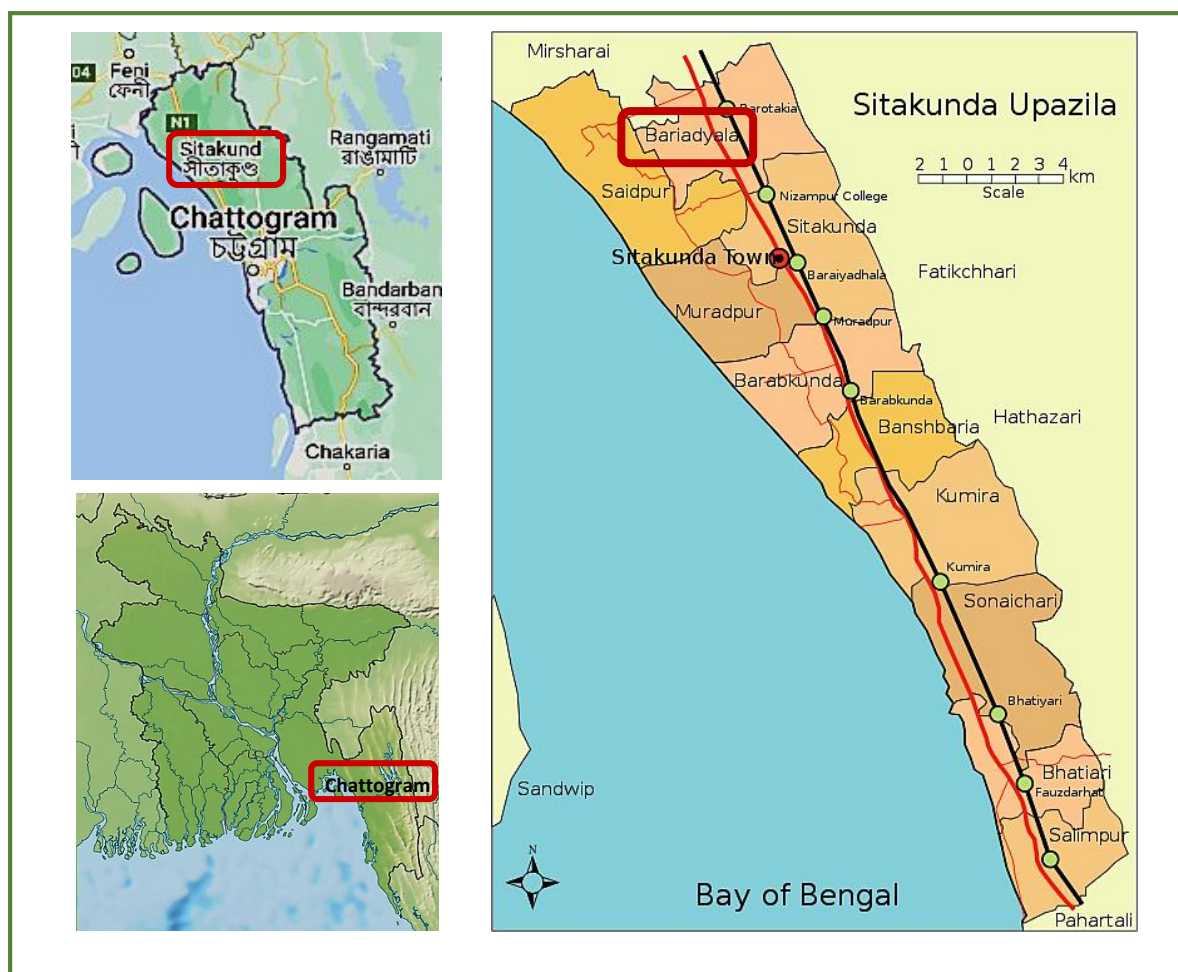


Figure 1 Map of the study area.

Data about aquatic animals (fish) of six ponds occupying three acres of area of a freshwater fish farm were collected during the study.

2.2. Study population:

To execute this study, total 10 types of fish which were being cultivated at those six ponds were considered for data collection. Here, probability sampling technique was used. The species of fishes with their initial stocking amount of hatchling is shown in Figure2.

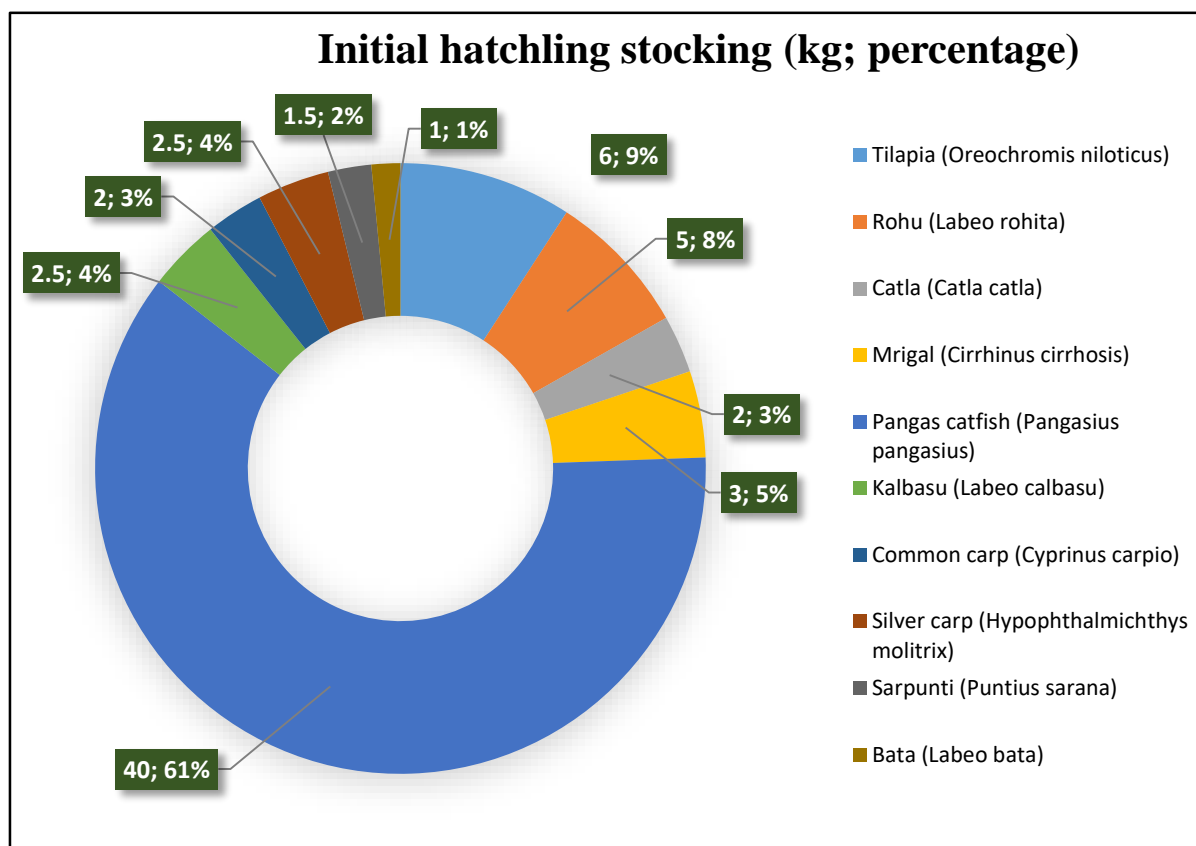


Figure 2 Initial stocked population.

2.3. Study design:

The studied fishes were cultivated in confined pond area. The pond and its soil were prepared and managed properly by applying lime, salt, potash, urea and TSP (triple super phosphate) which helps to maintain proper environment of pond and soil, keep good health, control disease and increase plankton within the pond.

After stocking the hatchlings or fry in pond, they were transferred in another pond after 20 days. Fishes were cultivated up to being juvenile and then adult. If any disease or abnormality was seen, proper medication and preventive measures were taken.

Fishes were fed both commercially bought feed and handmade customized feed in different stages of life. During hatchling or fry stage, commercial nursery 1 and nursery 2 feed were supplied. Then commercial young grower feed was supplied during juvenile stage. After that, handmade feed made with wheat bran, broken crushed maize, til oil cake, vitamins and minerals and water was given to adults. All the commercial feed and other feed ingredients were bought from well-known sources. Feed was given twice daily at the rate of 25kg per pond. During winter, feed was given once per day and during heavy rainy day or too much gloomy weather, feed was totally avoided.

2.4. Diagnosis of diseases and treatment:

Diagnosis of the diseases or abnormalities found in the fishes throughout the cultivation period was done based on clinical signs and physical appearance observed in fishes. In some cases, the changes in the water color and its turbidity also indicates abnormalities in environment of pond which causes disease or death of fishes. Medication of the affected fishes or affected pond was carried out properly according to the need. In [Table 1](#) there is shown the diseases found with their medication.

Table 1 Disease or abnormalities, their sign and medication of studied population

Name of disease or abnormality	Sign or appearance	Medication or preventive measure
1. Argulosis	<ul style="list-style-type: none"> • Lice is seen in fish • Reddish spot found around affected area 	<ul style="list-style-type: none"> -Application of lime -Application of potash
2. Epizootic Ulcerative Syndrome (UUS)	<ul style="list-style-type: none"> • Ulcerative lesions were found in body • Floating of fish over water surface was seen 	<ul style="list-style-type: none"> -Application of Timsen (n-Alkyl dimethyl benzyl ammoniumchloride, stabilized uer)
3. Gill Rot	<ul style="list-style-type: none"> • Lethargic fishes seen close to the surface of water with swollen gill 	<ul style="list-style-type: none"> -Preparation of tetracycline
4. Chilodonella infestation	<ul style="list-style-type: none"> • Brownish mucous material was seen on the skin of fish • Abnormal movement of fishes 	<ul style="list-style-type: none"> -Potash application
5. Hypoxia	<ul style="list-style-type: none"> • Open mouth breathing and surface respiration 	<ul style="list-style-type: none"> -Oxyren/ oxyflow
6. Dropsy	<ul style="list-style-type: none"> • Swollen abdomen • Pale coloration of fishes 	<ul style="list-style-type: none"> -Potash -Oxytetracycline

2.5. Data management and statistical analysis:

All data were entered, stored and managed in Microsoft Excel 2013 (15.0.4420.1007). Then the data were transferred to STATA-13 (Stata Corp, LP, 4905 Lakeway Drive, Special Edition, College Station, Texas 77845 USA) for performing statistical analysis.

Amount of chemicals used for prevention and preparation of pond were expressed in a bar chart where prevalence of disease was shown in a pie chart. Percentage of use of different types of medicines was expressed in a histogram. Mean of survivability and mortality rate were calculated using STATA.

Finally, a two sample T-test was carried out to observe the significance of mean of survival or health rate of two groups of fishes at the level of 5% significance. The result was expressed in mean and *p*-value.

3. Result

3.1. Precaution & Preparation of pond:

Disinfectant, antiseptics and fertilizers those were mostly used during pond preparation as precaution and preventive measure of disease control as well as health measure are shown in [Figure3](#). These chemicals were also used during culture period. Here we can see that, mostly used material is lime or calcium carbonate which was used as 100kg per acre of area. Amount of potash was very less, about 0.5kg per acre. Among fertilizers, amount of urea is more that is 40kg per acre than the amount of TSP that was used.

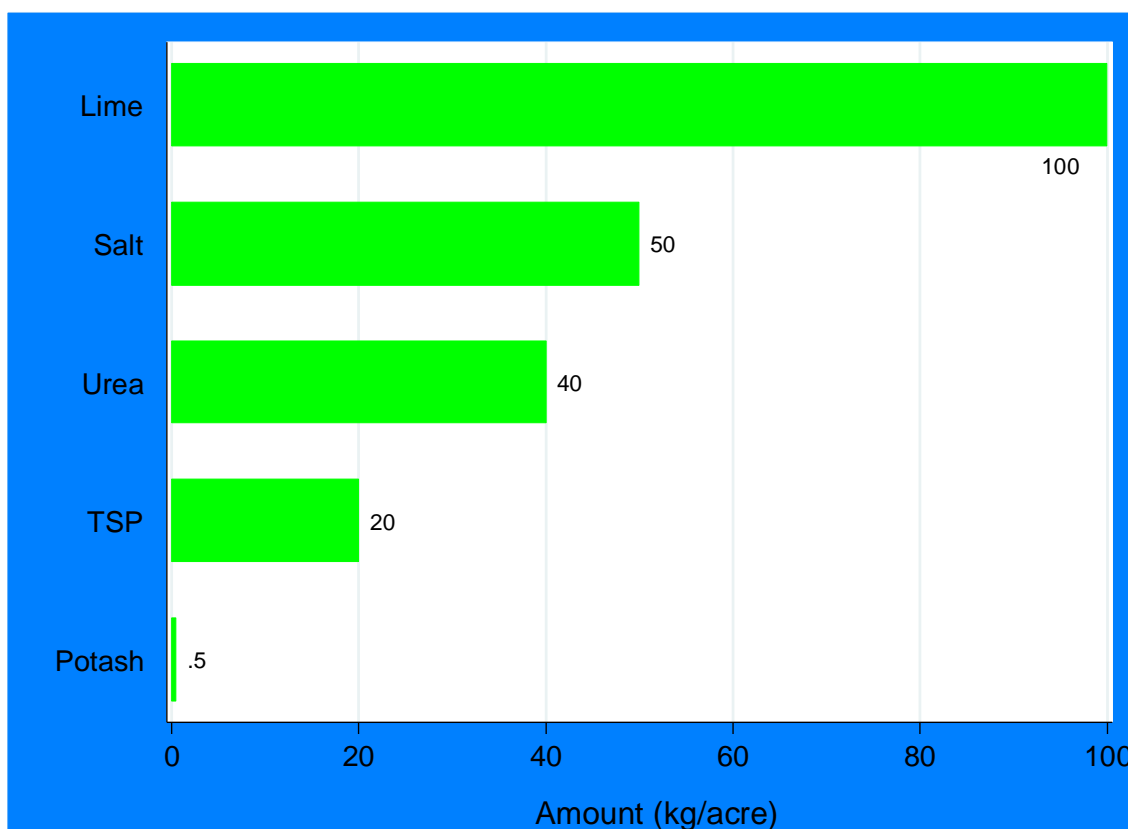


Figure 3 Chemicals used as preventive and preparation measure

3.2. Prevalence of disease:

Figure 4 shows a pie chart that represents prevalence of different diseases found in the study population. In this study, it is seen that, epizootic ulcerative syndrome or EUS is the most occurred disease in fishes in study area. About 29.17% cases among total diseases, is EUS. The second more occurred disease is dropsy that covers 18.75%. Besides these most common diseases, there also occurs chilodonella infestation, argulosis, giil rot and hypoxia at the rate of 16.67%, 14.58%, 12.50% & 8.33% respectively.

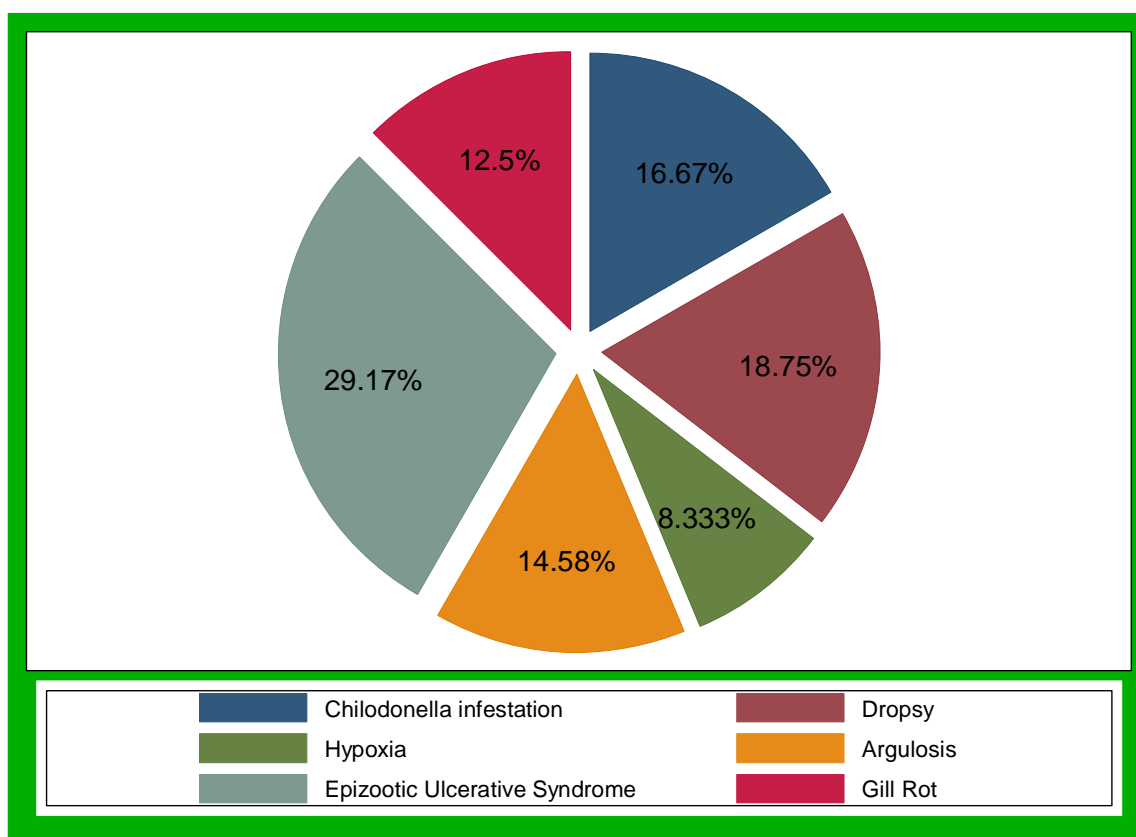


Figure 4 Graphical presentation of disease prevalence

3.3 Categories of medicine:

To treat the diseases many kinds of medicinal products had been used which categorization has been presented in a histogram in [Figure5](#). This figure shows that, among all categories, antiseptic and disinfectant at the rate of 62.5% had been used to cure disease or abnormalities, which is the highest. Antibiotic was used at 25% rate and oxygen enhancer was used at 12.5% rate in treatment of the diseases.

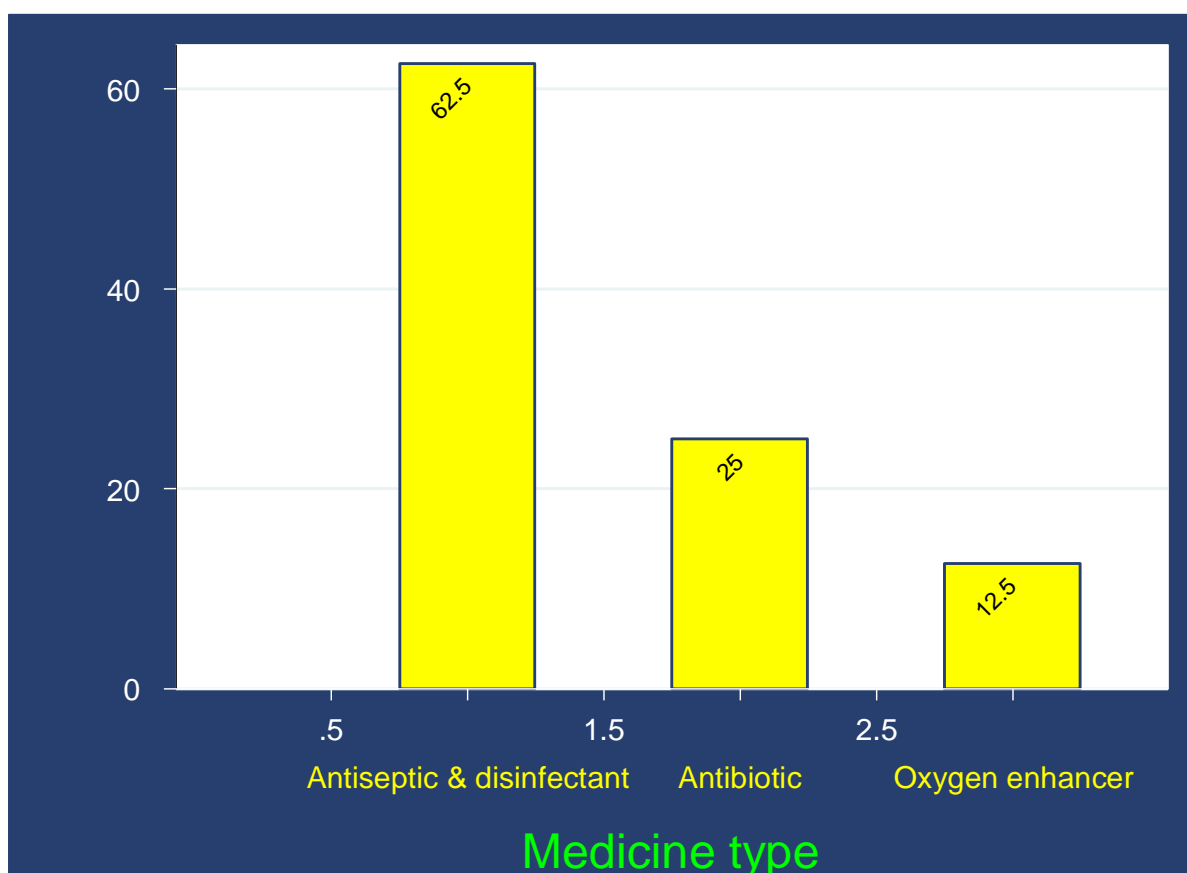


Figure 5 Percentage of different medicine categories

3.4. Survival rate and mortality:

In current study, different level of survival rate were seen in different species of fishes which is presented in [Table2](#) as percentage. Mortality rate of different species of fishes due to different diseases and abnormalities is also shown in [Table2](#).

Table 2 Survival and mortality percentage of different species of fishes

Fish name	Health or survival rate (%)	Mortality rate (%)
Tilapia	90	10
Rohu	80	20
Catla	45	55
Mrigal	85	15
Pangas catfish	50	50
Kalbasu	75	25
Common carp	60	40
Silver carp	65	35
Sarpunti	60	40
Bata	60	40

[Table3](#) presents statistical analysis of mean of survival rate and mortality rate. From this analysis it is seen that, mean of survival or health rate is 67 that is quite higher than the mortality rate that is 33, which assures that the survival of studied fish population is more than death.

Table 3 Mean calculation of survival and mortality rate

Variable	Observation	Mean	Std. Error	Std. Deviation
Health/survival rate	10	67	4.725816	14.94434
Mortality rate	10	33	4.725816	14.94434

3.5. Comparison of health:

From the observation of survival rate data shown in [Table2](#), it is determined that there are two types of fish survivability on this study. Thus, all the fish species were divided in two categories. Fish species having more than 50% survival rate were denoted as group A and less than or equal 50% survival rate were denoted as group B. According to [Table2](#), tilapia, rohu, mrigal, kalbasu, common carp, silver carp, sarpunti and bata are the fishes in group A and katla, pangash catfish are in group B.

Finally, a t-test were performed to observe the mean of both groups and to calculate the significance level of difference of mean which has been represented in [Table4](#).

Table 4 Comparison of healthier and less-healthier types of fishes

Groups	Observation	Mean	Std. Error	Std. Deviation	[95% Conf. Interval]
Group A	8	71.875	4.323679	12.22921	61.651122-82.09888
Group B	2	47.5	2.5	3.535534	15.73449-79.26551
Combined	10	67	4.725816	14.94434	56.30946-77.69054
Difference		24.375 ^a	9.097454		3.396233-45.35377
					t = 2.6793 degrees of freedom=8

^a means values have significance difference ($P < 0.05$)

[Table4](#) describes that health status of group A is significantly ($P < 0.05$) higher than the health status of group B. So fishes like tilapia, rohu, mrigal, kalbasu, common carp, silver carp, sarpunti and bata are healthier and the fishes like katla, pangash catfish are less healthier in this mix culture system.

4. Discussion

Maintaining of aquatic animal health is being appreciated in many studies. Factors related to this topic are described and examined in previous studies and the outcome is almost similar to present study.

We all agree to this fact that prevention is better than cure. Unlike other animals, health of aquatic animals are affected by the fact that whether preventive measures to control disease and to sustain good health are taken or not. In this study, we have seen that, lime, potash, salt, urea, TSP are mostly used chemicals and among them amount of lime is the highest. Hasan et al., (2020) also agreed that, for health and pond management, frequently used traditional chemicals are lime, salt, potassium permanganate, malachite green etc. and lime is widely used due to its availability and low cost.

Although, fishes can be affected by several types of diseases, it is found in present study that, prevalence of epizootic ulcerative syndrome is highest and the rate is 29.17% in studied population. This finding is almost similar to the literature of Kawsar et al., (2022) where they found EUS as most prevalent disease at the rate of 90%. But in the study of Faruk et al., (2004) it was found that epizootic ulcerative syndrome is the second highest disease. Besides, dropsy, chilodonella infestation, argulosis, gill rot and hypoxia also occurred in studied population at a certain rate which is supported by Sharma and Pandey, (2012).

Present study shows that, in treatment of fish diseases, antibiotics, disinfectants oxygen enhancer are being used which comply with the study of Kawsar et al., (2022). As antibiotic oxytetracyclin, tetracycline is mostly used. Lime, potash, timsen are used as disinfectant. These findings are supported by Kawsar et al., (2022)

If we focus on survival rate and mortality rate, we see that according to the calculation of present study, mean of survival rate is 67 and mean of mortality rate is 33. That

means, rate of survivability is more than the mortality rate which is supported by many studies. The culture system of this study is mix culture which was made up with tilapia, rohu, mrigal, kalbasu, common carp, silver carp, sarpunti, bata, katla and pangash catfish. In case of culture system selection of fish species is a major concern as it is related to the production rate and health of fish. Because some fish stay healthy and their production become high when they are cultured together, whereas other fish do not pose this synergistic criteria. From the observation of our study, we can see that, the survival or health rate of the fishes of first group is 71.8, that is significantly ($P < 0.05$) different and higher than the survival rate of the fishes of second group that is 47.5. Supporting our result, Selvamani and Mahadevan, (2008), reported that when rohu, carp fishes, mrigal are cultured combinedly, their production and health remain to notch.

Ultimately, it is proved that, all these combined factors or characteristics like selection of fish, preventive measure, pond preparation, disease diagnosis, treatment and control, effects health of aquatic animals like fish, and their health is not single but a collective form of these factors.

Conclusion

Aquatic animal health is a highly concerned matter at this day and age. So conserving of health of aquatic animal, especially of fishes is a mandatory thing. Current study implies that this matter is not engaged to a single factor, rather related to collective issues or factors like as fish selection, pond preparation, preventive measures, disease diagnosis and treatment. Although, data of individual fish was not considered and chemical analysis was not done, by statistical analysis it is seen that, all these factors influence efficiently to preserve the health. Therefore, a well combination of all aspects which are related to health, from pond preparation and fish selection to treatment is convenient to meet up ongoing demand of maintenance of aquatic animal health.

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Biography

I am Israt Jerin Tonni, daughter of Md. Mosarraf Hossain & Shirin Akter, from Sitakund, Chattogram. I passed Secondary School Certificate examination from Bangladesh Mahila Samiti Girls' High School & College in 2013 and Higher Secondary Certificate examination from Chittagong College in 2015. Now, I am studying as an intern student of 22nd batch in Chattogram Veterinary and Animal Sciences University under the Faculty of Veterinary Medicine to accomplish my graduation in Doctor of Veterinary Medicine. In the future I would like to work in the field of research related to veterinary profession.

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