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Patterns of pre-weaning piglet mortality and economic losses in field condition

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The study was purposively taken up with the objective to find out the patterns of pre-weaning piglet mortality and economic losses in field condition. The study was purposively taken up in Gorkhaland Territorial Administration area where pig farming is a common practice. The study shows that overall pre-weaning piglet mortality was 15.62% where it was slightly higher in exotic than indigenous breed. Highest pre-weaning mortality was recorded among 0 to 15 days age group piglets mainly during winter months and in third parity of dam. The major reasons of pre-weaning piglet mortality found in the study area were chilling, piglet anemia and scouring. Overall economic losses due to pre-weaning piglet mortality were around $18696 during the last 3 years in which it was around $5453 in indigenous breed and around $13243 in exotic breeds. Economic losses due to pre-weaning piglet mortality was recorded highest for scouring, followed by chilling and low birth weight in indigenous breed, whereas it was highest for piglet anemia followed by chilling and scouring in exotic breed. Therefore, proper healthcare programme and management practices must be undertaken to avoid these huge economic losses under field condition.

Key words: Piglet mortality, indigenous breed, exotic breed, piglet anemia.

INTRODUCTION

Pig production, particularly in the tropical Indian condition, has high potentials for optimum profit making. The profitability of swine industry largely depends on the survival of piglets/litters up to weaning besides other closely related factors such as litter size and weight of piglets at birth. The overall mortality as well as morbidity of pigs depends on pre-weaning care, management, litter size, weight of litter, age, season and effective health care. Causes of mortality and morbidity may be multi factorial, including lack of awareness among the farmers and pig breeders regarding management practices, disease prevention and control measures, and above all,

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a high incidence of fatal diseases (Mondal et al., 2012). Several studies had attributed neonatal mortality in pigs to be of multifactor causes including diseases; other factors were low viability, chilling, maternal overlay and poor management practices (Hrupka et al., 1998; John, 2004; Damron, 2009). Frazer (1990) defined neonatal mortality in pig as death that occurs in piglets within few days of life. In agreement, Hughes (1993) noted that 50% of all pre-weaning death occurs within the first three days of life and that 90% of all were within one week of parturition. Accordingly various researchers recorded neonatal mortality, such as Pathiraja et al. (1987) who noted it to be as high as 50%; Kumar et al. (1990) reported 28.14%; Grissom et al. (1990) reported between 12.2 and 24.2%; Boe (1994) reported 14.4%; Vaillancourt et al. (1994) reported between 10 and 15%; Varley (1995) reported 13% among cross breed; Tuchscherer et al. (2000) reported between 10 and 20%; Nandakumar et al. (2004) reported 31.36% among indigenous breed and 10.49% among crossed-bred; Wabacha et al. (2004) reported 18.70%; Dutta and Rahman (2006) reported 30.62%; Kliebenstein et al. (2007) reported 26.40%; Li et al. (2010) reported 23 and 27% and Pedersen et al. (2011) had reported 19%.

Further, the mortality pattern and occurrence of different diseases and disorders may also vary with different genetic groups of pigs (Gupta et al., 2001; Nandakumar et al., 2004). Not all the factors associated with mortality can be controlled, but understanding them will assist the farmers and producers in minimizing death loss (Holyoake et al., 1995). Retrospective study on mortality may play a role in forecasting the future occurrence of disease in a particular geographical area (Basumatary et al., 2010). Although a few studies have been conducted in a scattered way on mortality incidence of piglet in organized swine farm under tropical condition but mortality pattern needs to be documented in field condition. Therefore, the present study was undertaken to document the pre-weaning piglet mortality patterns and economic losses in field condition.

MATERIALS AND METHODS

Study location

The study was carried out in backyard pig farms located within Gorkhaland Territorial Administration (GTA) area. GTA is a semi-autonomous administrative body for Darjeeling hills in West Bengal, India. GTA replaced Darjeeling Gorkha Hill Council which was formed in 1988 and administered Darjeeling hills for 23 years (Anonymous, 2011; Dutta, 2011). GTA presently has three hill Sub-divisions Darjeeling, Kalimpong, Kurseong and some areas of Siliguri Sub-division under its authority. It has an area of 3,149 square kilometers. Annual mean maximum and minimum temperature at administrative headquarter of GTA (that is, Darjeeling town) is 14.9 and 8.9°C, respectively. Average rainfall is 2831.9 mm and average numbers of rainy days are 106 days (Anonymous, 2012). The altitude of Darjeeling town is 2134 m above sea level.

Study design

An ex post facto study was designed to analyze the patterns of pre-weaning piglet mortality and economic losses in field condition. A cross sectional field survey on backyard pig farms was conducted by stratified purposive sampling methods. The respondents selected for the study were those who maintain a breeding stock of at least 2 sows. One community block each was randomly selected from 3 sub-divisions to collect data for recording the parameters such as sex, age, season, dam, causes of mortality and economic losses due to mortality. From each community block, 2 villages were purposely selected on the basis of large numbers of pig breeders. From each village, 5 pig breeder of indigenous and exotic breed were selected randomly for data collection through simple random sampling, thus forming a sample size of 60 respondents' compound, 30 indigenous pig breeders and 30 exotic pig breeders. Data presented in the study were collected through personal interview schedule from the respondents for last 3 years from 2012 to 2014. Since backyard farmers did not keep record of their farm; data were collected from the respondents on recall basis. Pre-weaning mortality was calculated from the percent ratio of the piglet dead pre-weaning to piglet born alive. The pig mortality was again divided into five seasons (that is, Spring = March to April, Summer = May to July, Rainy = June to August, Autumn = September to November and Winter = December to February). The parity of dam was determined as first (Pty-1), second (Pty-2), third (Pty-3), fourth (Pty-4) and fifth onwards (Pty-5).

Data analysis

Data was coded and entered into excel spreadsheets and simple statistical analysis such as frequency, percentage, chi-square test was performed using SPSS 20.0 software.

RESULTS AND DISCUSSION

The study was conducted to record the pre-weaning piglet mortality only in the study area. Though still born mortality was also recorded. Stillborn mortality was 78 in indigenous breed (Male 37, Female 41) and 434 in exotic breed (Male 195, Female 239) during the last 3 years. The rate of stillborn is reported to be greatest in high parity sows (Li et al., 2010), probably due to dystocia caused by fatness or poor uterine muscle tone (Kirkden et al., 2013).

The average pre-weaning piglet mortality was 15.62%. The study further shows that mortality in exotic breeds was slightly higher (15.81%) than indigenous breed (15.26%). Mortality in female piglet was found higher in both indigenous and exotic breeds but chi-square test shows no significant difference in piglet mortality between male and female piglet among indigenous and exotic breeds. The chi-square test also shows no significant difference in piglet mortality between indigenous and exotic breeds (Table 1).

Mortality was found highest (6.94%) among piglets in the age group of 0 to 15 days. Piglet mortality reduced

Table 1. Sex-wise piglet mortality in indigenous and exotic breed in different years.

Year	Indigenous						Exotic						Total Mortality		
	No of birth			No. of death (%)			No of birth			No. of death (%)			No. of birth	No of death	Mortality (%)
	M	F	Total	M	F	Total	M	F	Total	M	F	Total			
2012	153	205	358	22 (14.38)	28 (13.66)	50 (13.97)	371	344	715	54 (14.56)	59(17.15)	113 (15.80)	1073	163	15.19
2013	165	162	327	28 (16.97)	31 (19.14)	59 (18.04)	343	296	639	59 (17.20)	67 (22.64)	126 (19.72)	966	185	19.15
2014	204	186	390	19 (9.31)	36 (19.35)	55 (14.10)	356	384	740	41 (11.52)	51(13.28)	92 (12.43)	1130	147	13.01
Total	**522**	**553**	**1075**	**69 (13.22)**	**95 (17.18)**	**164 (15.26)**	**1070**	**1024**	**2094**	**154 (14.39)**	**177 (17.29)**	**331 (15.81)**	**3169**	**495**	**15.62**
x^2	--	--	--	2.154^{NS}		--	--	--	--	0.232^{NS}		--	--	--	--
	--	--	--	0.350^{NS}									--	--	--

Figures in parenthesis indicate percentage; M= Male, F= Female, NS= Non significant.

Table 2. Age and sex-wise piglet mortality in indigenous and exotic breed.

Age (days)	Indigenous			Exotic			Total Mortality	
	No. of death (%)			No. of death (%)			No. of death	Mortality (%)
	M	F	Total	M	F	Total		
0-15	27 (5.17)	46 (8.32)	73 (6.79)	64 (5.98)	83 (8.11)	147 (7.02)	220	6.94
16-30	15 (2.87)	28 (5.06)	43 (4.00)	43 (4.00)	47 (4.59)	90 (4.30)	133	4.20
31-45	10 (1.92)	17 (3.07)	27 (2.51)	26 (2.43)	32 (3.13)	58 (2.77)	85	2.68
45 up to weaning	17(3.26)	4 (0.72)	21 (1.95)	21 (1.96)	15 (1.47)	36 (1.72)	57	1.80
x^2	1.893^{NS}		--	0.646^{NS}		--	--	--
	0.000^{NS}						--	--

Figures in parenthesis indicate percentage; M= Male, F= Female, NS= Non significant.

the age of the piglet increased. Mortality in female piglet was found higher in both indigenous and exotic breeds but chi-square test showed no significant difference in piglet mortality between male and female piglet among indigenous and exotic breeds due to age factors. The chi-square test also showed no significant difference in piglet mortality between indigenous and exotic breeds due to age factors (Table 2).

Highest mortality (33.16%) was recorded in winter seasons followed by rainy (19.57%) and spring seasons (10.46%). Similarly, mortality of both indigenous and exotic breed of piglet was recorded highest in winter followed by rainy and spring seasons. Mortality of female piglets was found higher in both indigenous and exotic breeds. Chi-square test shows highly significant difference in piglet mortality between male and female piglet in exotic breeds due to the effect of seasons but shows no significant difference in piglet mortality between male and female piglet in indigenous breeds due to the effect of seasons. The chi-square test also shows significant difference in piglet mortality between indigenous and exotic piglets due to the effect of seasons (Table 3). Kabuga and Annor (1991) also reported that the pre-weaning piglet mortality was highest at cold and rainy months.

Table 4 reveals that highest (17.96%) mortality was recorded in Pty-3 followed by Pty-1 (17.59%)

Table 3. Piglet mortality in indigenous and exotic breed according to season of death.

Season	Indigenous						Exotic						Total Mortality		
	No. of birth			No. of death (%)			No of birth			No. of death (%)			No of birth	No of death	Mortality (%)
	M	F	Total	M	F	Total	M	F	Total	M	F	Total			
Spring	124	128	252	12 (9.68)	17 (13.28)	29 (11.51)	241	253	494	11 (4.56)	38 (15.02)	49 (9.92)	746	78	10.46
Summer	96	85	181	3 (3.13)	8 (9.41)	11 (6.08)	227	209	436	7 (3.08)	22 (10.53)	29 (6.65)	617	40	6.483
Rainy	116	123	239	18 (15.52)	26 (21.14)	44 (18.41)	204	201	405	46 (22.55)	36 (17.91)	82 (20.25)	644	126	19.57
Autumn	84	120	204	7 (8.33)	15 (12.5)	22 (10.78)	209	158	367	12 (5.74)	21 (13.29)	33 (8.99)	571	55	9.632
Winter	102	97	199	29 (28.43)	29 (29.9)	58 (29.15)	189	203	392	78 (41.27)	60 (29.56)	138 (35.2)	591	196	33.16
x^2	--	--	--	2.453^{NS}		--	--	--	--	14.015^{**}		--	--	--	--
	--	--	--	23.546^{**}									--	--	--

Figures in parenthesis indicate percentage; M= male, F= female, NS= Non Significant, **p<0.01

Table 4. Piglet mortality in indigenous and exotic breed according to parity of dam.

Parity	Indigenous						Exotic						Total Mortality		
	No. of birth			No. of death (%)			No of birth			Mortality (%)			No of birth	No of death	Mortality (%)
	M	F	Total	M	F	Total	M	F	Total	M	F	Total			
Pty-1	74	89	163	9 (12.16)	15 (16.85)	24 (14.72)	102	116	218	15 (14.70)	24 (20.69)	39 (19.72)	381	67	17.59
Pty-2	89	101	190	8 (8.99)	12 (11.88)	20 (10.53)	179	162	341	12 (6.70)	25 (15.43)	37 (11.44)	531	59	11.11
Pty-3	136	124	260	22 (16.18)	24 (19.35)	46 (17.69)	249	215	464	24 (9.64)	36 (16.74)	60 (18.10)	724	130	17.96
Pty-4	121	137	258	18 (14.88)	27 (19.71)	45 (17.44)	324	276	600	27 (9.78)	53 (19.20)	80 (15.67)	858	139	16.2
Pty-5	102	102	204	12 (11.76)	17 (16.67)	29 (14.22)	216	255	471	17 (7.87)	39 (15.29)	56 (15.07)	675	100	14.81
x^2	--	--	--	0.168^{NS}		--	--	--	--	0.706^{NS}		--	--	--	--
	--	--	--	0.618^{NS}									--	--	--

Figures in parenthesis indicate percentage; M= male, F= female, NS= Non Significant

and Pty-4 (16.2%). Lowest mortality was recorded in Pty-2. The study shows no trends of piglet mortality due to parity of dam as found in earlier studies. Mortality in female piglet was found higher in both indigenous and exotic breeds but chi-square test shows no significant difference in piglet mortality between male and female piglet among indigenous and exotic breeds due to parity of dam. The chi-square test also shows no significant difference in piglet mortality between indigenous and exotic breeds due to parity of dam. The study contradicts the study of Daza et al. (1999) and Li et al. (2010) who had reported that piglet mortality rate increased by parity order.

This study has previously stated that the average pre-weaning piglet mortality was 15.62%. Further the study revealed that chilling (2.87%), piglet anemia (2.71%) and scouring (2.62%) were the major reasons for pre-weaning piglet mortality in the study area. The death due to scouring, individual low birth weight, starvation and gaining access to colostrums were comparatively higher in indigenous breeds of piglets than exotic piglets whereas death due to maternal overlay, piglet anemia were comparatively higher in exotic breeds of piglets than indigenous piglets (Table5).

Overall economic loss due to pre-weaning piglet

Table 5. Pre-weaning piglet mortality in indigenous and exotic breed according to causes.

Causes	Indigenous			Exotic			Overall mortality
	M	F	Total	M	F	Total	
Maternal over lay	2 (0.38)	6 (1.08)	8 (0.74)	11 (1.03)	22 (2.15)	33 (1.58)	41 (1.29)
Scouring	15 (2.87)	19 (3.44)	34 (3.16)	18 (1.68)	31 (3.03)	49 (2.34)	83 (2.62)
Hypoglycemia	6 (1.15)	8 (1.45)	14 (1.30)	12 (1.12)	15 (1.46)	27 (1.29)	41 (1.29)
Individual low birth weight	10 (1.92)	16 (2.89)	26 (2.42)	21 (1.96)	15 (1.46)	36 (1.72)	62 (1.96)
Piglet anemia	8 (1.53)	16 (2.89)	24 (2.23)	34 (3.18)	28 (2.73)	62 (2.96)	86 (2.71)
Cannibalism	0	0	0	9 (0.84)	3 (0.29)	12 (0.57)	12 (0.38)
Starvation and gaining access to colostrums	9 (1.72)	15 (2.71)	24 (2.23)	17 (1.59)	19 (1.86)	36 (1.72)	60 (1.89)
Chilling	17 (3.26)	12 (2.17)	29 (2.70)	26 (2.43)	36 (3.52)	62 (2.96)	91 (2.87)
Unknown causes	2 (0.38)	3 (0.54)	5 (0.47)	6 (0.56)	8 (0.78)	14 (0.67)	19 (0.6)

Figures in parenthesis indicate percentage; M= male, F= female.

Table 6. Economic losses due to piglet mortality in filed condition.

Causes of Mortality	Indigenous							Exotic							Total economic losses ($)
	Male			Female			Economic loss ($)	Male			Female			Economic loss ($)	
	2012	2013	2014	2012	2013	2014		2012	2013	2014	2012	2013	2014		
Maternal over lay	1	0	1	2	3	1	246	2	5	4	6	8	8	1285	1531
Scouring	5	6	4	7	5	7	1099	12	3	3	9	13	9	1863	2962
Hypoglycemia	2	1	3	2	3	3	455	2	6	4	6	4	5	1053	1508
Individual low birth weight	2	6	2	6	6	4	837	7	9	5	3	5	7	1428	2265
Piglet anemia	6	1	1	2	6	8	756	15	12	7	14	8	6	2378	3134
Cannibalism	0	0	0	0	0	0	0	4	3	2	1	0	2	478	478
Starvation and gaining access to colostrums	2	4	3	4	5	6	782	4	7	6	9	6	4	1393	2175
Chilling	3	9	5	4	3	5	982	8	12	6	11	16	9	2393	3375
Unknown causes	1	1	0	1	0	2	161	0	2	4	0	7	1	566	727
Total economic losses				**5318**							**12837**				**18155**

mortality was around $18155 among the respondents during last 3 years. Economic losses due to pre-weaning piglet mortality in indigenous breed were around $5318 whereas the economic losses in exotic breed were around $12837 during last 3 years (Table 6). Economic losses due to pre-weaning piglet mortality was recorded highest for scouring followed by chilling and low birth weight in indigenous breed whereas it was highest

for piglet anemia followed by chilling and scouring in exotic breed.

Conclusion

The study shows that pre-weaning piglet mortality was a major problem among the pig farmers in the study area. As we know that all the factors associated with mortality cannot be controlled, but understanding them and taking proper healthcare, feeding and management practices will assist the farmers and producers in minimizing death loss. Therefore, proper healthcare programme and management practices must be undertaken in advance to avoid these huge economic losses under field condition. The extension workers in the study area also need to enrich knowledge of the pig breeders with scientific pig farming practices comprising breeding, feeding, healthcare and management practices so that pre-weaning mortality of the piglet can be reduced. Policy makers further need to take initiative to provide healthcare services to their doorstep without much time lag.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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