

Full Length Research Paper

Neonatal mortality of pigs in Nsukka, Southeast Nigeria

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This study was conducted to investigate the causes of neonatal mortality among pig farms in Nsukka Local Government area of Enugu State, Nigeria. Forty (40) pig farms in the study area were randomly selected and used for the 20 weeks study duration. One week post partum was considered as the neonatal period. A total of 124 pregnant sows and 924 piglets farrowed during the study period were used. Data were obtained from farm visitations/physical observations, farm records, oral interviews and structured questionnaires. Feed samples were analyzed for their proximate contents. Pregnant pigs were weighed prior, during and few days after farrowing, while piglets were weighed within seven days after farrowing. Necropsy and bacteriological examinations of samples of feed, maternal and diseased or dying neonates were also carried out. Results showed that mean litter size, piglet weight at birth and daily weight gain were 7.45 ± 0.02 , 1.01 ± 0.03 and 0.21 ± 0.01 kg, respectively. 164 (17.75%) of total piglets farrowed died within the first week of life (neonatal period), whereas 144 (87.80%) of this number died within the first five days. In addition, 48 (29.27%) were over laid, 30 (18.29%) died of scouring caused by *Escherichia coli* and *Salmonella* organisms, 30 (18.29%) died of hypoglycaemia. On the other hand, 20 (12.20%) piglets were cannibalized by older pigs and or their dams, 16 (9.75%) were trapped within the drainage, 12 piglets (7.32%) died of chilling, while eight (4.88%) died of unknown causes. Other contributory factors include inappropriate farm structures, absence or inadequate farm records, nutritional imbalance, improper management practices and inadequate veterinary services. It was concluded that neonatal mortality is a major impediment to optimum profit making from swine enterprise in Nsukka, South Eastern Nigeria.

Key words: Neonatal, piglets, mortality, Nsukka urban, Nigeria, sow performance.

INTRODUCTION

Pig production particularly in the tropics has high potentials for optimum profit making. Unfortunately, this is often constrained by poor management practices including poor feasibility studies, inadequate feeds and feeding materials, technological application and neonatal mortality among others (Schwartz and Franzen, 1992; Varley, 1995). Frazer (1990) defined neonatal mortality in pig as death that occurs in piglets within few days of life. Similarly, Varley (1995) on observing the improvement in the reproductive performance of exotic pigs also noted high level of neonatal mortality up to 13%. According to Pathiraja et al. (1987), neonatal mortality in small holder

farms at southern Zaria, Kaduna State, Nigeria, was noted to be as high as 50%. 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.

Several studies had attributed neonatal mortality in pigs to be of multifactor causes including diseases such as colibacillosis, salmonellosis and piglet anaemia. Other factors were low viability, chilling, maternal overlay and poor management practices (Hrupka et al., 1998; John, 2004; Damron, 2009). There is sparse information on the causes of neonatal mortality of pigs in Nsukka area in particular and sub-Saharan tropics in general. This situation no doubt has affected pig production in the study area. In order to examine the causes of neonatal mortality of pigs in Nsukka and its environs, this study was aimed at; (i) identifying the possible causes of neonatal

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pig mortality in pig farms at Nsukka urban and its environs, (ii) provide baseline data which will serve as a reference point for further studies and (iii) proffer solutions to identified problem(s) with a view to reducing pre-weaning mortality and hence increase swine productivity within the area.

MATERIALS AND METHODS

The study area

The study was carried out in pig farms located within Nsukka Local Government area (LGA). Nsukka LGA is located in the derived savannah zone ecological zone at latitude 6° 51' 24"N and longitude 7° 23' 45"E at an elevation of 1,810 ft (550 m) above sea level. It covers a total land area of 17.52 sq miles (45.38 km²) (https://en.wikipedia.org/wiki/Nsukka#cite_note-umuahia_population-0). The area experiences two distinct seasons; rainy and dry seasons. The 2006 population census report showed that Nsukka had an estimated population of 309, 633. The indigenous people are involved in agriculture, basically crop and livestock farming activities (Nwanta et al., 2011). The major animal production activities in the area are poultry and pig although other livestock like goat, sheep and cattle are produced (Nwanta et al., 2011).

A multi-stage sampling procedure was used to select towns and communities for the study. Four communities namely; Ehalumona, Edemani, Obukpa and Obimo were randomly selected representing Nsukka east (NE), Nsukka west (NW), Nsukka north (NN) and Nsukka south (NS) of Nsukka LGA. A total of 10 pig farms were randomly selected from each community based on the willingness of the owners to engage in the study and also make available the farm records. In all, a total of 40 randomly selected pig farms were used and the farmers were all interviewed. These farms were selected based on the pig population ranging from 20 to 200 heads. Generally, the research methodology used involved farm visitations/physical observations, farm records, oral interviews and the use of structured questionnaires.

A total of 124 sows farrowed and 924 piglets produced were used in this study which lasted five months (April to September). On visiting a farm, information on date of mating and expected date of farrowing was recorded. Physical observation of farm structure (presence or absence of basic facilities), the herd structure and compounded pig feed was also carried out on each visit. Performance data namely live weight of gestating or lactating sows, piglet birth weight, litter size etc, were obtained from the selected pig farms by means of weekly or biweekly visits by a trained technician per farm. A total of 40 technical staff was used for the study.

Live weights of pregnant or lactating pigs were determined using weigh band (Farmer's boy®; Dalton Supplies Limited Oxon, England) on day 90 of gestation, at term, on day three and seven after farrowing. On the other hand, individual piglets were weighed using weighing balance (Avery, England) on days one, three and seven of life. Number of piglets that died within seven days at individual farms was recorded and possible causes of death determined at necropsy. Samples collected for necropsy were rectal swabs, excised organs and feed samples from affected farms. Feed samples were also randomly collected from 20 farms and analyzed for its proximate compositions. Similarly necropsies were carried on dead piglets, bacteriological examinations were made on samples collected from some feed samples, unhealthy piglets and their dams using standard methods of counting bacteria. Structured questionnaires, available farm records and oral interviews were used to obtain data covering incidence of diseases, treatment,

breed, feeds and feeding and other management problems encountered in the farm.

Determination of composition of feed samples

Feed samples were randomly collected from 20 farms and analyzed for their proximate contents at the Nutrition Laboratory, Department of Animal Science, Faculty of Agriculture and Energy Research and Development Centre both at the University of Nigeria, Nsukka. The analysis was carried out according to the methods of Association of Analytical Chemists (AOAC, 1990) with a view to determining their carbohydrate, crude protein, ash, ether extract, crude fibre, phosphorus and calcium contents, respectively; thus metabolizable energy was determined by Gallenkamp ballistic bomb calorimeter; crude protein was determined by the micro Kjeldahl technique, ether extract was determined by soxhlet fat extraction method, crude fibre was determined by the Weende method, while calcium and phosphorus were determined using the atomic absorption spectrophotometer.

Statistical analysis

Mean statistics and standard deviation (SD), charts and percentages were used to analyze the data. Statistical Package for Social Science (SPSS) version 11 was the package used for the data analysis.

RESULTS

Observations made on the farms showed that the herd structure comprised piglets, growers, gilts, sows and boars; usually they are not separated by sex, age or weight. Generally, the pigs are genetically improved breeds (Large White, Landrace, Duroc and their crosses). However, due to uncontrolled breeding programme practiced by the farmers, it was not possible to categorize them into a particular crossbred. There were no records of the presence of indigenous breed of pigs in the study area. The results on sow and litter performance are presented as means and standard deviation in Table 1. The results show that mean gestation period was 113.18 ± 2.00 days, while dams' mean weight at term, litter weight and litter size were 84.49 ± 1.94 kg, 1.01 ± 0.13 kg and 7.45 ± 0.02 , respectively.

Our findings as presented in Table 2 and Figure 1 show that most piglets (29.27%) died as a result of crushing by their dams, this was followed by hypoglycaemia (18.29%) and diarrhoea or scouring (18.29%) caused by *Escherichia coli* and *Salmonella* organisms, while 4.88% piglets died of unknown etiologic agent. Results of the daily neonatal pig mortalities among farms in the study area are presented in Table 3. The study shows that most piglets lost due to maternal overlay died within four days of life. Generally, high neonatal mortalities/death occurred on the second day of farrowing.

The analytical composition of samples of feed made available to pigs in Nsukka and its environs are presented in Table 4. The results show that pig rations were grossly deficient in energy, protein and other essential

Table 1. Performance of sows and litters within seven days of farrowing in pig farms surveyed in Nsukka Southeast Nigeria (n = 40).

Parameter	Mean \pm SD
Mean weight at day 90 of gestation (kg)	95.06 \pm 2.48
Gestation period (days)	113.18 \pm 2.00
Sow weigh at term (kg)	84.49 \pm 1.94
Litter size	7.45 \pm 0.02
Piglet weight at birth (kg)	1.01 \pm 0.13
Sow weight loss (kg/day)	0.54 \pm 0.02
Piglet weight gain(kg/day)	0.21 \pm 0.04
Number (n) of piglets lost (n/day)	23.43 (19.29%)
Total number of deaths	164 (17.75%)

Table 2. Identified causes of neonatal deaths in pig farms surveyed in Nsukka Southeast Nigeria (n = 40).

Cause	Number dead	% Mortality
Maternal over lay	48.00	29.27
Scouring (<i>Escherichia coli</i> and <i>Salmonella</i>)	30.00	18.29
Hypoglycaemia	30.00	18.29
Cannibalism	20.00	12.20
Trapped	16.00	9.76
Chilling	12.00	7.32
Unknown	8.00	4.88
Total	164	100.00

nutrients. Also, the feed had very high fibre content. This high content of fibre may be attributed to the high quantity of palm kernel cake (PKC) used in formulating the ration. It was observed that farmers depended on individually mixed feed formulated using locally available feed materials like PKC, brewer's spent grain, cassava (peels and chips), bambara waste, kitchen waste, rice husk, common salt etc. Adesehinwa et al. (2003) reported that pig farmers depended more on the use of non-conventional feedstuffs obtained from farm, household and agro-industrial wastes in formulating ration for pigs. The authors noted that these materials are indispensable for many of the farmers to keep operational cost, particularly average daily feeding cost within a range of one to twenty naira per pig.

The results of the disease prevalence in pig farms in Nsukka communities are presented in Table 5 and Figure 2. The results show that diarrhoea/scouring, trypanosomosis, helminthosis, swine erysipelas, ectoparasitism and foot rot are the prevalent diseases in pig farms in the study area. Helminthosis was the most common disease (32.00 and 38.10%) followed by diarrhoea (16.00 and 19.05%) and ectoparasitism (12.00 and 14.29%), while foot rot (4.00 and 4.76%) was found to be the least prevalent diseases of pigs in Nsukka environ.

The farmer's affirmative answers on common herd structure and management techniques identified in pig

farms in Nsukka Southeast Nigeria are presented in Table 6. The results indicate that less than 15% of the farms identified had knowledge of fattening/isolation pens, herd health programme, identification of pigs, castration and/or stock pigs by sex or age. More than 65% of pig farms were identified to provide feed/water troughs for the pigs, keep other livestock and administers iron dextran to their piglets. The result also indicates that livestock replacement is common among farmers in Nsukka area.

DISCUSSION

It is significant to note that performance of pigs in most farms within Nsukka and environ is very low when compared to what is obtainable in pig farms in other parts of Nigeria and other developed countries. Consequently, mean litter size (7.45 \pm 0.02), weight at birth (1.01 \pm 0.13 kg) and dam gestation weight loss (0.54 \pm 0.02 kg/day) are low when compared with litter size of 11.50 \pm 0.20 reported by Lay et al. (2001) and very low dam weight loss of 0.12 \pm 0.03 kg/day noted by others (Hrupka et al., 1998 and John, 2004). Similarly, our finding on litter size of 7.45 \pm 0.02 was less than 9.57 and 11.00 reported by Omeke (1990) and Iheukwumere et al. (2008) for pigs in North Central and South Eastern Nigeria, respectively.

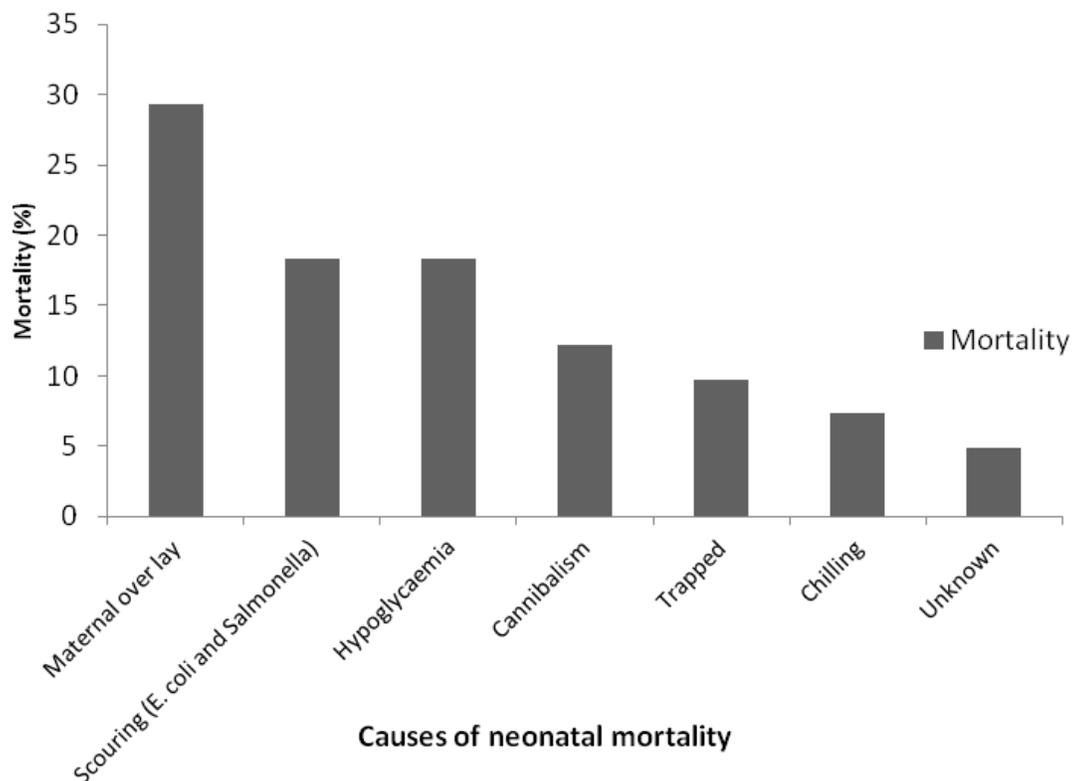


Figure 1. Causes of neonatal mortality of pigs in Nsukka communities.

Table 3. Neonatal pig mortality in pig farms surveyed in Nsukka Southeast Nigeria (n = 40).

Cause	Day							Total
	1	2	3	4	5	6	7	
Scouring/diarrhoea	-	4 (2.44)	6 (3.66)	2 (1.22)	8 (4.88)	10 (6.10)	-	30 (18.29)
Crushing/maternal overlay	6 (3.66)	20 (12.20)	14 (8.54)	4 (2.44)	2 (1.22)	-	-	46 (28.05)
Trapped	-	-	6 (3.66)	-	-	8 (4.88)	2 (1.22)	16 (9.76)
Hypoglycaemia	-	30 (18.29)	-	-	-	-	-	30 (18.29)
Cannibalism	-	12 (7.32)	8 (4.88)	-	-	-	-	20 (12.20)
Chilling	-	4 (2.44)	6 (3.66)	4 (2.44)	-	-	-	14 (8.54)
Unknown	-	-	8 (4.88)	-	-	-	-	8 (4.88)
Total	6 (3.66)	70 (42.68)	48 (29.27)	10 (6.10)	10 (6.10)	18 (10.98)	2 (1.22)	164 (100.00)

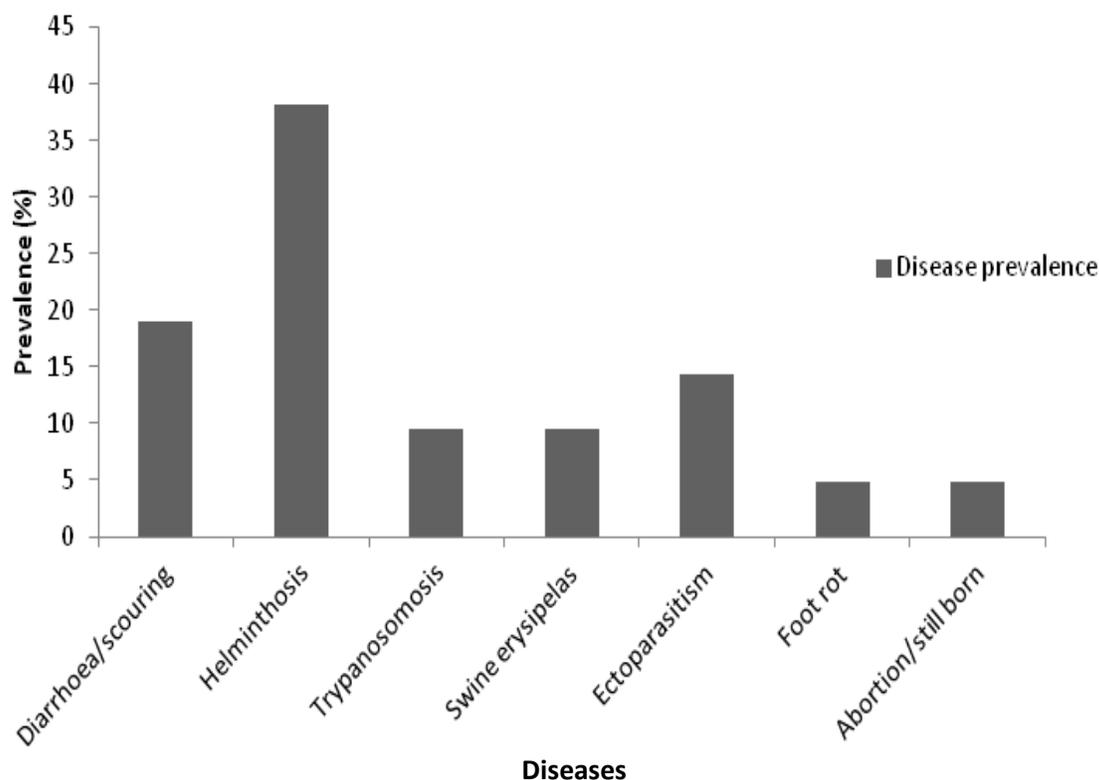
**Figures in parenthesis represent percentages of the total.

Table 4. Analytical composition of samples of pig feed surveyed in Nsukka Southeast Nigeria (n = 20).

Nutrient	Composition (%)
Crude protein	12.18 ± 1.32
Metabolizable energy (kcal/kg)	2048.10 ± 16.25
Crude fibre	10.12 ± 0.15
Ether extracts	3.43 ± 0.00
Ash	2.51 ± 0.06
Calcium	0.21 ± 0.05
Phosphorus	0.18 ± 0.00

Table 5. Disease prevalence in 40 pig farms surveyed in Nsukka Southeast Nigeria.

Disease	Number of occurrence	Occurrence (%)
Diarrhoea/scouring	16.00	19.05
Helminthosis	32.00	38.10
Trypanosomosis	8.00	9.52
Swine erysipelas	8.00	9.52
Ectoparasitism	12.00	14.29
Foot rot	4.00	4.76
Abortion/still born	4.00	4.76

**Figure 2.** Disease prevalence in 40 pig farms in Nsukka and its environs.

Low performance of pigs in this study is related to poor infrastructure and management technique that are characteristics of pig production practice in the area. For example, the observed farm structures showed poorly constructed houses which lacked basic facilities. Similarly, proximate composition of feed available to the pigs of all types was observed to be below the National Research Council (1998) nutritional recommended standard. This may have been responsible for high number of piglets (30.00 or 18.29%) loss resulting from hypoglycaemia and significant daily weight loss by the dams during first seven days of lactation. Johnston et al. (1997) and Damron (2009) recommended that lactating sows should be fed high energy dense diets in order to control nutritional deficiencies and maintain them in good body

condition necessary to overcome the physiological stress that accompanies lactation.

Our observation of high piglet death rate (42.68%) for piglets within their first two days of birth is reminiscent to the observations made by Pathiraja et al. (1987). The authors noted death rates of 50% among small holder pig farms in Zaria, North Central Nigeria. From Table 1, 164 piglets were lost within the study period. In financial terms, as much as N738, 000.00 (\$4670.89) or N18, 450.00 (\$116.77) per farm was lost. This inference was based on the fact that a piglet was sold at an average price of N4500 (\$28.48) and exchange rate of \$1.00:N158.00 at the time of this research. This figure represents a huge economic loss to pig farmers in Nsukka and its environs and a concomitant drop in the

Table 6. Farmer's affirmative answers on common herd management techniques identified in pig farms in Nsukka Southeast Nigeria.

Technique	Number of farms	Percent of total (n=40)
Has a farm record	4.00	10.00
Pig identification	2.00	5.00
Stock pigs by age, sex or size	1.00	2.50
Presence of fattening and or farrowing pen(s)	2.00	5.00
Presence of isolation pen(s)	2.00	5.00
Provision of feeding and drinking troughs	28.00	70.00
Practice of creep feeding	0.00	0.00
Mixture of other livestock	30.00	75.00
Castration	4.00	10.00
Any selection	0.00	0.00
Administer iron dextran	28.00	70.00
Consult veterinarian when animal is sick	14.00	35.00
Knowledge of herd health	1.00	2.50
Livestock off take/replacement	36.00	90.00

amount of pork supplied to the food chain of consumers in the country. On the other hand, Susias (1994) observed low death rate of 14.50% over a period of five days. Variations in piglets' death rates reported by this author and that obtained in this study could be attributed to differences in breed, nutrition, climate and management. For instance, the authors may have made their observation among fairly managed farms in developed countries. Varley (1995) had consequently highlighted high mortality rates for piglets within their first three days in life. This risky period demands special attention from farmers with a view to minimizing undue losses among piglets. Hughes (1993) recommended that within this period when piglets had not fully developed peripheral body insulators such as fat, external thermoregulation method(s) need be applied. Deaths following chilling could be avoided if farmers are enlightened on the provision of artificial heat source such as light, stove or beddings in form of wood shavings to keep the environment warm for the newly born pigs. Similarly, death due to maternal overlay and cannibalism could be avoided by selecting breeder pigs with good mothering ability, provision of farrowing pens and adequate accommodation.

Trypanosomosis was observed to have occurrence rate of 9.52%. This figure was below 30.70% reported by Onah (1991). Differences in these observations might have been influenced by the fact the most farmers in Nsukka area in an attempt to meet local demand now keep mainly crossbred pigs which was reported by Omeke (1994) to be less susceptible to trypanosomosis infection than their pure breed counterparts. Other management practices necessary for farmers to minimize neonatal mortality in piggery farms include provision of farrowing crates, assurance that piglets suckle their dam immediately after farrowing, provision of balanced diets to

gestating and lactating dams and maintenance of high standard of hygiene within the farm premises. These are in agreement with recommendations of Paul (1989), Lay et al. (2001) and Battaglia (2007). Other prevalent diseases implicated as causes of neonatal mortality and low performance of pigs includes parasitism, scouring and trypanosomosis (Table 5). These diseases not only predispose dam to abortion and mummification of foetuses, but also lead to neonatal death. These were noted through farm records, observations made and necroptic examinations conducted in the present study. Several authors (Pathiraja et al., 1987; Radostits et al., 2003) have also observed significant neonatal losses due to piglet anaemia and scouring in line with the findings made in the present work.

Demand for pork in Nsukka area is high and there are no cultural or religious barrier affecting its consumption. This may account for the high percentage (90%) of regular offtake and replacement of livestock observed in many farms investigated. Thus, there is high potential for optimum profit making from pig farming in Nsukka, South Eastern Nigeria. Based on our findings, it is our recommendation that there is need to promote extension and herd health services by relevant professional and livestock personnel to potential and existing farmers in the area. The benefits of these will include good application of improved farming technique, proper utilization of agro-industrial wastes to formulate balanced and affordable diets for pigs, significant reduction in neonatal death and subsequent improvement in financial return to pig farmers.

REFERENCES

- Adesehinwa AOK, Aribido SO, Oyediji GO, Obiniyi AA (2003). Production strategies for coping with the demand and supply

- of pork in some peri-urban areas of Southwestern Nigeria. *Livestock Research for Rural Development* 15 (10). Retrieved March 27, 112, from <http://www.lrrd.org/lrrd15/10/ades1510.htm>
- Association of Official Analytical Chemists (1990). *Official methods of analysis*, 15th edition. Washington D.C.
- Battaglia RA (2007). *Handbook of Livestock Management*. 4th edn. Pearson Educational Inc. Upper Saddle River, New Jersey. USA. pp. 561-562.
- Damron WS (2009). *Introduction to Animal Science: Global, Biological, Social and Industrial Perspective*. 4th edn. Pearson Education Inc. Upper Saddle River, New Jersey, USA. pp. 460-467.
- Frazer D (1990). Behavioural perspective on piglet survival. *J. Rep. Fertil.* 40(Suppl.):355-370.
- Hrupka BJ, Leibbramelt VD, Greenshaw ID, Benevenga NJ (1998). The effects of farrowing crate, heat lamp location on sow and pig patterns of lying on piglet survival. *J. Anim. Sci.* 76(12): 2996-3002.
- Hughes PE (1993). Piglet management. In: Varley MA, Williams PEV and Lawrence TIJ (Eds). *Neonatal survival and growth*. Occasional Publication No. 18. Br. Soc. Anim. Prod. Leeds, UK. pp. 245-273.
- Ihekumwumere FC, Ndubisi EC, Etusiim PE (2008). The use of different sources of protein on growth and reproduction of pigs. *Pak. J. Nutr.* 7(4): 590-593.
- John G (2004). 1984-2004, the difference. *Pig progress*, 20(9): p. 28.
- Johnston LJ, Pettigrew JE, Shurson GC (1997). Sow nutrition and reproduction. *Pig. News Inform.* (18): 261-264
- Lay DC, Matteri RI, Carol JA, Fangman JI, Safranski IJ (2001). *Preweaning Survival in Swine*. *J. Anim. Sci.* 80(suppl):74-86.
- National Research Council (1998). *Nutrient requirements of swine* 10th edition. Washington National Academy Press Washington D.C.
- Nwanta JA, Shonyinka SVO, Chah KF, Onunkwo JO, Onyenwe IW, Eze JI, Iheagwam CN, Njoka EO, Onyema I, Ogbu KI, Mgbegbu EC, Nnadozie PN, Ibe EC, Oladimeji KT (2011). Production characteristics, disease prevalence, and herd-health management of pigs in Southeast Nigeria. *J. Swine Health Prod.* 19(6):331-339.
- Omeke BCO (1990). Seasonal breeding performance in the field of landrace and large white pigs under humid environment. *World Rev. Anim. Prod.* 25(4): 33-36.
- Omeke BCO (1994). Pig trypanosomiasis: prevalence and significance in the endemic Middle Belt zone of Southern Nigeria. *Revue Elev. Med. Vet. Pays Trop.* 47(4):381-386.
- Onah DN (1991). Porcine trypanosomiasis in Nigeria: infection in local and exotic pigs in Nsukka area of Anambra state. *Trop. Anim. Health Prod.* 23:141-146
- Pathiraja N, Oyedipe EO, Alhasan WS (1987). Pig Production in Nigeria. *Pig News Inform.* 8(2):165-170.
- Paul S (1989). United Kingdom Welfare Code Recommendations. In: *pig International*, (19): p. 22.
- Radostits OM, Gay CC, Blood DC, Hinchcliff KW (2003). *Veterinary Medicine: a textbook of the diseases of cattle, sheep, pigs, goat and horses*. 9th edn. Saunders Elsevier Services Limited. 90 Tottenham court Road, London. pp. 1505-1506.
- Schwartz HJ, Franzen H (1992). Potentials and Limitations of Biotechnology in Livestock Production in developing countries. *Proceeding of International Symposium held at the institute of Basic Animal Sciences, University of Benin, Edo state. Nigeria.* pp. 6-12.
- Susias VC (1994). Monitoring of Piglet losses in Intensive Swine Production. *J. Anim. Sci.* (48):83-91.
- Varley MA (1995). Factors affecting mortality rates. In: *Neonatal natal pig survival and Development*. CAB International Walling Ford Publishers UK. pp. 11-13.