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Performance of large white Yorkshire piglets reared on cement concrete floor during pre-weaning period

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Abstract
24 LWY piglets were selected immediately after birth and were reared on cement concrete floor till weaning (56 days) to assess the effect of flooring system on growth, biometry and physiological parameters. The mean birth weight (kg) and weaning weight (kg) of LWY piglets was 1.15±0.03 and 8.03±0.23. The mean body length and height at withers at birth was 22.20±0.51 (cm) and 15.28±0.52 (cm). The total gain in heart girth (cm) and hip-width (cm) from birth to weaning was 17.52±0.42 and 5.55±0.23. A linear increase was observed in all biometry measurements from birth to weaning as age advanced which is a general characteristic of growth. The overall mean rectal temperature (102.35±0.05 ^{0}F), respiration rate (55.04±0.46 breaths/min) and pulse rate (96.67±0.67 beats/min.) of piglets were appeared to be within normal physiological range.

Keywords: Large white Yorkshire piglets, biometry, physiological responses, cement concrete floor

1. Introduction
The challenges faced by the country in securing food as well as nutritional security for the fast-growing population need an integrated approach in livestock farming. Pig farming has the potential to provide employment opportunities to seasonally employed rural farmers and supplementary income to improve their living standards. Pig has got one of the highest feed conversion efficiencies *i.e*., they produce more live weight gain from a given weight of feed than any other class of meat-producing animals except the broilers. Pigs can utilize a wide variety of feedstuffs *viz*. grains, forages, damaged feeds, and garbage and convert them into valuable nutritious meat. Pigs are one of the most prolific breeders with high fecundity and shorter generation interval. They have high growth potential of reaching market weight at an early age under better management conditions.

Flooring type may affect growth performance if the flooring material causes stress to the animal. Therefore, the ideal bed needs to be hygienic, dry, resilient, and reasonably temperature resistant. Proper flooring management and design are critical for better health care, longevity, comfort, and increased productivity. A balance must exist between animal comfort and well-being, cleanliness, and feed digestibility and efficiency. So, there is a need to explore different materials as floors to ensure the balance between comfort and productivity.

As in India much work on effect of flooring systems on performance in pigs is not done. In view of the above, the present study was planned to study the effect of concrete floor on growth performance of L.W. Y. piglets in the intensive system as a part of effect of different flooring systems *viz*. elevated slatted floor, soil floor, rubber mat floor on performance of piglets.

2. Materials and Methods
The present study was undertaken to find out the effect of concrete floor on growth performance and physiological responses of Large White Yorkshire piglets during pre-weaning period under an intensive system. The experimental procedures and techniques adopted during the course of the study are detailed in this chapter.

2.1 Location of the study
The experiment was conducted at Pig Unit, Livestock Farm Complex (LFC), College of Veterinary Science, Rajendranagar, Hyderabad.

2.2 Environmental conditions
Hyderabad is located in central Telangana and the city lies at 17.366° N latitude and 78.476° E longitude in the Deccan Plateau and rises to an average height of 536 m above the sea level. Hyderabad has a unique combination of a tropical wet and dry climate that borders on a hot semi-arid climate (Koppen climate classification). During the period of the study, the average maximum temperature recorded was 31.5 °C while the average minimum temperature was 21.7 °C.

2.3 Selection of experimental animals
Two weeks before farrowing, three advanced pregnant sows were transferred to the farrowing pen with a creep area. After furrowing, day old 24 Large White Yorkshire piglets of either sex from three litters were selected from the pig unit of LFC of C.V.Sc., Rajendranagar and reared on normal conventional concrete flooring along with their mother till weaning. Experiment was carried out for a period of 56 days during the pre-weaning period (May 2020 to July 2020).

2.4 Housing and management of experimental animals
All the piglets were housed under conventional housing with concrete floor along with their mother provided with a floor space of 9 m2 / sow in the covered shed with asbestos roof. The experimental piglets were ear notched for proper recording of the data. The needle teeth of the piglets were cut on the birth day. All the piglets were injected with iron on the 4th day and 14th day and vitamin A on the 14th day of the experiment. All the experimental animals were kept under hygienic conditions throughout the experimental period. Healthy surroundings and proper cleanliness was maintained in the experimental sheds. Proper feeding and watering arrangements were made hygienically.

2.5 Feeding and watering management
Experimental piglets during the pre-weaning period were provided with the creep ration as per ICAR (2013), the composition of the creep ration is presented in Table 2.1. Creep feed was provided to piglets during the pre-weaning period once a day ad-libitum in the creep area from the 21st day of age. Leftover of feed, if any, was recorded next day morning at 24 hours intervals throughout the experiment to calculate the total feed consumed per day. Potable, clean and fresh drinking water was made available to each animal in separate water troughs throughout the experimental period.

2.6 Body weight gain
Body weights of piglets were recorded at fortnightly intervals throughout experiment a digital electronic platform weighing balance before offering feed and water in the morning. Total weight gain was calculated by subtracting final body weight from initial body weight.

2.7 Average daily gain (ADG)
The average daily gain was calculated by using the following formula

$$ADG = \frac{\text{Final weight (kg)} - \text{Initial weight (kg)}}{\text{Number of days}}$$

ADG was calculated fortnightly during experimental period.

2.8 Feed intake
Feed offered and feed refusal was monitored fortnightly for each litter during pre-weaning period and feed intake was calculated.

Table 1: Ingredient composition of concentrate mixture (kg)

Ingredient	Creep feed (Pre-Starter ration) (%)	Grower ration (%)
Body weight (kg)	Up to10	10 to 25
Maize	32	34
De-oiled rice bran (DORB)	15	15
Red gram chuni (RGC)	11	19
Groundnut cake (GNC)	39	29
Mineral mixture	2	2
Salt	1	1
CP Supplied*(%)	20.02	18.1

*(ICAR, 2013)

2.9 Biometric Measurements
Body measurements were recorded by using a standard measuring tape to the nearest 0.5 centimeters after the animals were allowed to stand squarely on an even ground. This was performed before offering feed and water in the morning.
The body measurements were recorded as per Gautam *et al.* (2018) as mentioned below.

2.9.1 Body length (BL): Body length was measured from the top of the head in between the ears to the base of the tail.

2.9.2 Heart girth (HG): Heart girth was measured around the body just behind the front legs and over the shoulder area.

2.9.3 Height at wither: Height at wither was measured from the top of the withers to the bottom of the foreleg.

2.9.4 Hip width (HP): Distance from the tuberosity prominence of ilium bone of one side to the other, across the rump.

2.10 Crude Protein (CP)
A known quantity of the ground samples (appropriate aliquots) were digested using Turbo therm (Gerhardt, Germany) with the suitable quantity of concentrated H_2SO_4 in the presence of catalytic digestion mixture ($CuSO_4$ and K_2SO_4 in 1:10 ratio). An acid blank was also run along with the samples for correction of any nitrogen contribution by the acid itself. The nitrogen content of the sample was estimated by distilling in auto-analyzer (Vapodest, Gerhardt, Germany). The nitrogen content multiplied by the factor 6.25 arrives the CP content of the sample, which was expressed as a percentage on DMB. (AOAC, 2005) [1].
The data was subjected to analysis of variance (Snedecor and Cochran, 1994) [39] and a comparison of means of different treatment groups was made by Duncan's multiple range test (Duncan, 1955).

3. Results
3.1 Growth Performance
3.1.1 Body Weights
The data on fortnightly body weight gain in LWY piglets is presented in Table 3.1. The mean birth weight (kg) of LWY piglets was 1.15±0.03 which was increased to 8.03±0.23 by the fourth fortnight. The bodyweight of piglets increased as they advanced in age and fortnightly body weight was statistically significant (p<0.01) among all fortnights. The total gain in body weight (kg) from birth to weaning was 6.88±0.22.

3.1.2 Average Daily Gain
The observed fortnightly Average Daily Gain (ADG) is presented in Table 3.2. The observed average daily gain (g) was 96.28±4.19, 88.10±6.48, 122.62±9.57, and 183.78±6.58 in the first, second, third, and fourth fortnight respectively. There was a significant difference in average daily gain ($p<0.01$) among different fortnights. The overall mean average daily gain (g) was 122.69±4.20 during pre-weaning period.

3.1.3 Creep feed intake
During the pre-weaning period creep feed was provided to the piglets from the second fortnight and data was recorded from the second fortnight and presented in Table 3.3. The recorded creep feed intake (kg) was 0.093±0.00, 0.138±0.01, and 0.261±0.01 in the second, third and fourth fortnight respectively. There was a significant difference in creep feed intake ($p<0.01$) among different fortnights. The overall mean feed intake during the pre-weaning period was 0.164±0.00 kg.

3.2 Biometry of piglets during pre-weaning period
Piglets have a balanced relationship between body weights and biometry. The body measurements included in the study were body length, heart girth, height at withers, and hip-width, during different fortnights.

3.2.1 Body Length
The results under the experiment regarding fortnightly body length (BL) are presented in Table 3.4 The mean body length at birth was 22.20±0.51 (cm) and increased to 30.82±0.17, 33.66±0.32, 39.62±0.50, and 45.35±0.47 cm during the first, second, third, and fourth fortnight respectively. Statistical analysis revealed a significant ($p<0.01$) difference among mean body length at birth and between all fortnights throughout the experiment. The overall mean body length (cm) was 34.33±0.26 during the pre-weaning period.

3.2.2 Height at Withers
The data on the fortnightly height at withers is presented in Table 3.5. Mean height at withers (cm) at birth was 15.28±0.52 and increased to 19.50±0.33, 22.34±0.35, 26.52±0.34, and 30.49±0.25 during the first, second, third, and fourth fortnight respectively. Statistical analysis showed a significant ($p<0.01$) difference in height at withers between all the fortnights and at birth. The overall mean height at withers (cm) was 22.83±0.29 and the total gain observed was 15.21±0.49 from birth to a fourth fortnight during the pre-weaning period.

3.2.3 Heart Girth
The result regarding fortnightly heart girth is presented in Table 3.6. The mean heart girth (cm) ranged from 26.88±0.23 at birth to 44.40±0.48 at the fourth fortnight. Statistical analysis revealed a significant ($p<0.01$) difference between all the fortnightly heart girth. The overall mean heart girth (cm) was found to be 34.72±0.28 and the total gain in heart girth from birth to weaning was 17.52±0.42 cm.

3.2.4 Hip Width
Data on fortnightly hip width during the pre-weaning period is presented in Table 4.7. The perusal of the results presented in Table 3.7 pertaining to the fortnightly hip width revealed that the mean hip width (cm) at birth was 5.35±0.13 whereas the same was 6.60±0.07, 7.62±0.08, 9.26±0.16, and 10.90±0.20 during the first, second, third, and fourth fortnight respectively. Statistical analysis revealed a significant difference ($p<0.01$) in mean hip-width between hip-width at birth and all fortnights. The overall mean hip-width was 7.94±0.09 during pre-weaning age and the total gain in hip-width from birth to weaning age was 5.55±0.23 during the pre-weaning period.

Table 2: Body weight (kg) of L.W.Y. piglets during the pre-weaning period.

Floor type	Birth weight (kg)	Body weight (kg)				Overall mean body weight (kg)	Total gain in body weight (kg)
		F1	F2	F3	F4		
Concrete	1.15±0.03^{e}	2.49±0.06^{d}	3.73±0.12^{d}	5.46±0.19^{c}	8.03±0.23^{a}	4.17±0.11^{d}	6.88±0.22
N	24						
SEM	0.182						
P Value	0.000						

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 3: ADG (gm/day) of L.W.Y. piglets during the pre-weaning period.

Floor type	Average daily gain (gm/day				Overall mean ADG (gm/day)
	F1	F2	F3	F4	
Concrete	96.28±4.19^{c}	88.10±6.48^{c}	122.62±9.57^{b}	183.78±6.58^{a}	122.69±4.20
N	24				
SEM	4.058				
P Value	0.000				

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 4: Creep feed intake (kg/day/head) of L.W.Y. piglets during the pre-weaning period.

Floor type	Creep feed intake (kg/day/head)			Overall mean creep feed intake (kg/day/head)
	F2	F3	F4	
Concrete	0.093±0.00^{d}	0.138±0.01^{c}	0.261±0.01^{a}	0.164±0.01
N	24			
SEM	0.011			
P value	0.000			

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 5: Body length (cm) of L.W.Y. piglets during the pre-weaning period.

Floor type	Body length at birthday	Body length (cm)				Overall mean body length (cm)	Total gain in body length (cm)
		F1	F2	F3	F4		
Cement concrete	22.20±0.51	30.82±0.17	33.66±0.32	39.62±0.50	45.35±0.47	34.33±0.26	23.16±0.71
N	24						
SEM	0.630						
P Value	0.000						

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 6: Height at withers (cm) of L.W.Y. piglets during the pre-weaning period.

Floor type	Height at withers at birthday	Height at withers (cm)				Overall mean height at withers (cm)	Total gain in height at withers (cm)
		F1	F2	F3	F4		
Cement concrete	15.28±0.52^{e}	19.50±0.33^{d}	22.34±0.35^{c}	26.52±0.34^{b}	30.49±0.25^{a}	22.83±0.29^{c}	15.21±0.49
N	24						
SEM	0.427						
P Value	0.000						

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 7: Heart girth (cm) of L.W.Y. piglets during the pre-weaning period.

Floor type	Heart girth at birthday	Heart girth (cm)				Overall mean heart girth (cm)	Total gain in heart girth (cm)
		F1	F2	F3	F4		
Concrete	26.88±0.23^{e}	29.95±0.28^{d}	33.44±0.32^{c}	38.93±0.48^{b}	44.40±0.48^{a}	34.72±0.28^{c}	17.52±0.42
N	24						
SEM	0.636						
P Value	0.000						

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 8: Hip width (cm) of L.W.Y. piglets during the pre-weaning period.

Floor type	Hip width on birth day	Hip width (cm)				Overall mean hip width (cm)	Total gain in hip width (cm)
		F1	F2	F3	F4		
Cement concrete	5.35±0.13^{e}	6.60±0.07^{d}	7.62±0.08^{c}	9.26±0.16^{b}	10.90±0.20^{a}	7.94±0.09	5.55±0.23
N	24						
SEM	0.154						
P Value	0.000						

Means with different superscripts row-wise differ significantly: $p<0.01$.

3.3 Physiological parameters of piglets during pre-weaning period

Physiological parameters included during pre-weaning period were rectal temperature, respiration rate, and pulse rate.

3.3.1 Rectal Temperature

Data on fortnightly rectal temperature during the pre-weaning period is presented in Table 3.8. From the perusal of the results presented in Table 4.8 revealed a mean rectal temperature (^{0}F) of 101.76±0.12, 102.10±0.12, 102.40±0.10, 102.69±0.09 and 102.83±0.18 at birth, first, second, third and fourth fortnights respectively. Statistical analysis revealed the highest rectal temperature during the fourth fortnight but did not differ significantly with the first, second, and third fortnight. Mean rectal temperature at birth was lowest and comparable with first fortnight but significantly ($p<0.01$) different from second, third, fourth, and overall rectal temperature. The overall mean rectal temperature of piglets was 102.35±0.05 during pre-weaning age.

3.3.2 Respiration Rate

Data on fortnightly respiration rate during the pre-weaning period is presented in Table 3.9. As presented in Table 4.9 the mean respiration rate (breaths/min) was 59.21±0.65, 55.04±0.46, 50.79±0.82, 46.38±0.73, and 41.21±1.18 at birth, first, second, third, and fourth fortnight respectively during the pre-weaning period. There was a continuous decrease in mean respiration rate from birth to weaning during the pre-weaning period. The statistical analysis discovered a significant ($p<0.01$) difference in mean respiration rate at birth and all the fortnights. The overall mean respiration rate in piglets was 55.04±0.46 during the pre-weaning period.

3.3.3 Pulse Rate

Data on pulse rate in piglets during the pre-weaning period is presented in Table 3.10. Mean pulse rate (beats/min) was highest at birth i.e., 115.17±2.40 and then decreased to 96.67±0.67, 96.00±1.88, 94.33±2.28, and 92.00±1.87 during the first, second, third, and fourth fortnight. Mean pulse rate at birth showed a statistically significant ($p<0.01$) difference with all the fortnights. The overall mean pulse rate was 93.63±1.38.

Table 9: Rectal temperature (^{0}F) of L.W.Y. piglets during the pre-weaning period

Floor type	At birth day	Rectal temperature (^{O}F)				Overall mean rectal temperature (^{O}F)
		F1	F2	F3	F4	
Cement concrete	101.76±0.12^c	102.10±0.12^{bc}	102.40±0.10^{ab}	102.69±0.09^a	102.83±0.18^a	102.35±0.05
N		24				
SEM		0.056				
P value		0.000				

Means with different superscripts row wise differ significantly: $p<0.01$.

Table 10: Respiration rate (breaths/min) of L.W.Y. piglets during the pre-weaning period.

Floor type	Respiration rate at birth day	Respiration rate (breaths/min)				Overall mean respiration rate (breaths/min)
		F1	F2	F3	F4	
Concrete	59.21±0.65^a	55.04±0.46^b	50.79±0.82^c	46.38±0.73^d	41.21±1.18^e	55.04±0.46
N		24				
SEM		0.587				
P value		0.000				

Means with different superscripts row-wise differ significantly: $p<0.01$.

Table 11: Pulse rate (beats/min) of L.W.Y. piglets during the pre-weaning period

Floor type	Pulse rate at birth day	Pulse rate (beats/min)				Overall mean pulse rate (beats/min)
		F1	F2	F3	F4	
Cement concrete	115.17±2.40^a	96.67±0.67^b	96.00±1.88^b	94.33±2.28^b	92.00±1.87^b	96.67±0.67
N		24				
SEM		0.956				
P value		0.000				

Means with different superscripts row-wise differ significantly: $p<0.01$.

4. Discussion

4.1 Growth performance

4.1.1 Body Weights

Body weight gain is an important indicator in deciding the performance and health status of any animal. The mean body weight at birth (1.15±0.03 kg) of LWY piglets was increased to 8.03±0.23 kg by the fourth fortnight at weaning. The bodyweight of piglets increased as they advanced in age and size. The fortnightly body weight was statistically significant ($p<0.01$) among all fortnights. The total gain in body weight (kg) from birth to weaning was 6.88±0.22.

The value for birth weight found in the present study is in concurrence with the findings of Cauveri *et al.* (2009) [10], Kaushik *et al.* (2013) [18], Pandurangareddy *et al.* (2013) [29], Jaishankar *et al.* (2015) [16], Gowrimanokari *et al.* (2018) [15], Ravindra Kumar *et al.* (2018) [35] and Ashitha *et al.* (2019) [6]. In contrary to the present findings, higher values were reported by Arango *et al.* (2006) [6], Raseel *et al.* (2016) [34], and Archana *et al.* (2018) [5]. Kumar *et al.* (2019) [21] have reported higher values for birth weight whereas, Rokde *et al.* (2013) [36], Debnath *et al.* (2015) [11], and Sandhu *et al.* (2018) [37] reported a lower value for birth weight.

The results for weaning weight in the present study are supported by the results of Palve *et al.* (2000) [28], Cauveri *et al.* (2009) [10], Ramesh and Sivakumar (2009) [32] Rokde *et al.* (2013) [36], Devendran *et al.* (2015) [12], Archana *et al.* (2018) [5], and Kumar *et al.* (2019) [21]. Higher weaning weight in LWY piglets compared to present study were reported by Narayanan *et al.* (2008) [24], Kaushik *et al.* (2013) [18] Pandurangreddy *et al.* (2013) [29], Jaishankar *et al.* (2015) [16], Raseel *et al.* (2016) [34], Ravindra Kumar *et al.* (2018) [35], Sandhu *et al.* (2018) [37], and Ashitha *et al.* (2019) [6].

4.1.2 Average Daily Gain

The overall mean average daily gain (g) was 122.69±4.20 during pre-weaning period. Similar findings were observed by Plave *et al.* (2000) [28], Jayashree and Shivakumar (2013) [17], Ravindra kumar *et al.* (2018) [35], Ashitha *et al.* (2019) [6] and Keyho *et al.* (2019) [19].

The present findings were not in agreement with Prasad *et al.* (2006) [31], Kaushik *et al.* (2013) [18], Ramesh *et al.* (2014) [33], Jaishankar *et al.* (2015) [16] and Sandhu *et al.* (2018) [37] who reported higher values for pre-weaning average daily gain compared to the findings of the present study. This might be due to the issue of variation in milk yield of the sows. The pre-weaning body weights are also influenced by the mothering ability of the sows.

4.1.3 Creep Feed Intake

The recorded average daily creep feed intake (kg/piglet) was 0.093±0.00, 0.138±0.01, and 0.261±0.01 during the second, third and fourth fortnight respectively. There was a significant difference in creep feed intake ($p<0.01$) among different fortnights. The overall mean daily feed intake (kg/piglet) was 0.164±0.00 kg during the pre-weaning period.

The present findings were not in agreement with Fraser *et al.* (1994) [13], Bruininx *et al.* (2002) [8], Bruininx *et al.* (2004) [9], Sulabo *et al.* (2010) [40], Sulabo *et al.* (2010a) [41], Toi (2017) [46] who reported higher values for daily creep feed intake in piglets during pre-weaning period. Lower level of creep feed intake was reported by Pajor *et al.* (1991) [27], Tissopi *et al.* (2020) [43], Kumar *et al.* (2012) [22], Middelkoop *et al.* (2019) [23].

There was a great variation in creep feed intake of the piglets during pre-weaning period and this could be due to many factors affecting the creep feed intake in piglets like birth weight, milk yield and milk composition of the sow, diseases and quality and palatability of the creep feed.

4.2 Biometry of piglets during different fortnights pre-weaning

4.2.1 Body Length

The mean body length at birth was 22.20±0.51 (cm) and increased to 30.82±0.17, 33.66±0.32, 39.62±0.50, and 45.35±0.47 during the first, second, third, and fourth fortnight respectively. Statistical analysis revealed a significant

($p<0.01$) difference among mean body length at birth and between all fortnights throughout the experiment. The overall mean body length (cm) was 34.33±0.26 during the pre-weaning period. The increase in the body length during the study period indicated a general feature irrespective of flooring system

The present findings are in accordance with Oluwole *et al.* (2014) [26] and Birteeb *et al*. (2015) [7], but in disagreement with Alenyorege *et al*. (2013) [3], Talwar (2014) [42], Tissopi *et al.* (2019) [44] and Khargharia *et al*. (2014) [20].

4.2.2 Height at Withers

Mean height at withers (cm) at birth was 15.28±0.52 and increased to 19.50±0.33, 22.34±0.35, 26.52±0.34, and 30.49±0.25 during the first, second, third, and fourth fortnight respectively. Statistical analysis showed a significant ($p<0.01$) difference in height at withers between all the fortnights and at birth. The overall mean height at withers (cm) was 22.83±0.29 and the total gain observed was 15.21±0.49 from birth to a fourth fortnight during the pre-weaning period.

The present findings are in accordance with the findings of Tissopi *et al.* (2019) [44] Birteeb *et al*. (2015) [7] and in disagreement with Oluwole *et al.* (2014) [26] who reported higher height at withers and Khargharia *et al.* (2014) [20] have reported lower values for height at withers.

4.2.3 Heart Girth

The mean heart girth (cm) at birth observed was 26.88±0.23 which was increased to 29.95±0.28, 33.44±0.32, 38.93±0.48, and 44.40±0.48 during the first, second, third, and fourth fortnight respectively. Statistical analysis revealed a significant ($p<0.01$) difference in mean fortnightly heart girth between heart girth at birth and all four fortnights. The overall mean heart girth (cm) was 34.72±0.28 and the total gain in heart girth from birth to weaning was 17.52±0.42 during pre-weaning age.

The present findings were similar with the findings of Adeola *et al.* (2013) [2], Alenyorege *et al*. (2013) [3], Oluwole *et al.* (2014) [26], Birteeb *et al*. (2015) [7], and Tissopi *et al.* (2019) [44]. Khargharia *et al.* (2014) [20] and Talwar (2014) [42] reported lower values for heart girth, hence dissimilar to the present findings.

4.2.4 Hip Width

Mean hip width (cm) at birth recorded was 5.35±0.13 and increased to 6.60±0.07, 7.62±0.08, 9.26±0.16, and 10.90±0.20 during the first, second, third, and fourth fortnight respectively. Statistical analysis revealed a significant difference ($p<0.01$) in mean hip-width between hip-width at birth and all fortnights. The overall mean hip-width was 7.94±0.09 during pre-weaning age and the total gain in hip-width from birth to weaning age was 5.55±0.23 during the pre-weaning period.

The present findings were dissimilar with Adeola *et al.* (2013) [2] who reported higher values for hip width.

In this study all the biometric measurements indicated that during the period of growth all the parameters shown a linear progression.

4.3 Physiological parameters during different fortnights pre-weaning

4.3.1 Rectal Temperature

Mean rectal temperature recorded was (^{0}F) of 101.76±0.12, 102.10±0.12, 102.40±0.10, 102.69±0.09 and 102.83±0.18 at birth, first, second, third and fourth fortnights respectively. Statistical analysis revealed the highest rectal temperature during the fourth fortnight but did not differ significantly with the first, second, and third fortnight. Mean rectal temperature at birth was lowest and comparable with first fortnight but significantly ($p<0.01$) different from second, third, fourth fortnight, and overall rectal temperature. The overall mean rectal temperature of piglets was 102.35±0.05 during pre-weaning age.

Present findings are similar to the findings of Peter *et al.* (2002) [30], Sipos *et al.* (2013) [38], and Nuntapaitoon *et al.* (2018) [25] who have reported increase in rectal temperature of piglets as age advanced.

4.3.2 Respiration Rate

Mean respiration rate (breaths/min) observed was 59.21±0.65, 55.04±0.46, 50.79±0.82, 46.38±0.73, and 41.21±1.18 at birth, first, second, third, and fourth fortnight respectively during the pre-weaning period. There was a continuous decrease in mean respiration rate from birth to weaning during the pre-weaning period. The statistical analysis discovered a significant ($p<0.01$) difference in mean respiration rate at birth and all the fortnights and mean respiration rate was similar during the second and third fortnight. The overall mean respiration rate in piglets was 55.04±0.46 during the pre-weaning period.

These results are supported by the result of Sipos *et al.* (2013) [38] who have reported decrease in respiration rate as age advanced.

4.3.3 Pulse Rate

Mean pulse rate (beats/min) observed was highest at birth i.e., 115.17±2.40 and then decreased to 96.67±0.67, 96.00±1.88, 94.33±2.28, and 92.00±1.87 during the first, second, third, and fourth fortnight. Mean pulse rate at birth showed a statistically significant ($p<0.01$) difference with all the fortnights. The mean pulse rate at the third and fourth fortnight was not statistically significant. The overall mean pulse rate was 93.63±1.38 and was comparable with the second fortnight during the pre-weaning period.

Sipos *et al.* (2013) [38] recorded decrease in pulse rate of piglets from birth to weaning and these findings were in agreement with the present results, but the pulse rate recorded by Sipos *et al.* (2013) [38] was higher than the present findings. This might be due to variability in environmental conditions.

The results with regards to respiration rate and pulse rate were almost in consistent with literature cited attributing to the fact that as piglets grow in age there will be decline in the specific rate whereas rectal temperature rise slightly as age advanced during pre-weaning period.

5. Conclusion

The results of the present study indicated that the concrete floor did not cause any stress as reflected by normal average daily gain, creep feed intake, biometric measurements and physiological responses.

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7. References

1. AOAC. Official methods of analysis. 18 Ed. Association of Official Analytical Chemist, Benjamin Franklin Station, Washington, DC; c2005.

2. Adeola AC, Oseni SO, Omitogun OG. Morphological characterization of indigenous and crossbred pigs in rural and peri-urban areas of southwestern Nigeria. Journal of Animal Sciences. 2013;3:30-235.
3. Alenyorege B, Addy F, Abgolosu AA. Linear body measurements as predictors of live weight of the large white pig in Northern Ghana. Ghanaian Journal of Animal Science, 2013, 7.
4. Arango J, Misztal I, Tsuruta S, Culbertson M, Holl J W and Herring W. Genetic study of individual pre-weaning mortality and birth weight in large white piglets using threshold-linear models. Livestock Science. 2006;101:208-218.
5. Archana K, Selvam S, Sivakumar T, Serma Saravana Pandian A, Balasubramanyam D, Mohamed Safiullah A. Effects of Season, Sex and Period of Farrowing on Growth Performance of Large White Yorkshire Pigs. International Journal of Pure and Applied Bioscience 2018;6(5):900-903.
6. Ashitha K, Balusami C, John Abraham, Senthilmurugan S, Sakkariya Ibrahim NP. Effect of brooding systems on growth performance in large white yorkshire piglets. The Pharma Innovation Journal. 2019;8(9):195-198.
7. Birteeb PT, Tetteh SO,Salifu AS. Growth performance and weight estimation of Large White piglets weaned at different ages. Research & Reviews: Journal of Veterinary Science and Technology. 2015;4:15-23.
8. Bruininx EMAM, Binnendijk GP, Van der Peet-Schwering CMC, Schrama JW, Den Hartog LA, Everts H, *et al*. Effect of creep feed consumption on individual feed intake characteristics and performance of group-housed weanling pigs. Journal of animal science. 2002;80:1413-1418.
9. Bruininx EMAM, Schellingerhout AB, Binnendijk GP, Van der Peet-Schwering CMC, Schrama JW, Den Hartog LA, *et al*. Individually assessed creep food consumption by suckled piglets: Influence on post-weaning food intake characteristics and indicators of gut structure and hind-gut fermentation. Animal Science. 2004;78:67-75.
10. Cauveri D, Sivakumar T, Devendran P. Pre-weaning body weights in large white Yorkshire crosses. Indian Journal of Animal Research. 2009;43:130-132.
11. Debnath BC, De A, Ravikanth K. Evaluation of herbal maternal care product for timely conception, optimized fetal growth and survival rate in large white Yorkshire Sow. The Pharma Innovation. 2015;4:93.
12. Devendran P, Gopinathan A, Murugan M, Cauveri D. Pre-weaning body weights of Large White Yorkshire (50%) pig crosses over generations. Indian Journal of Animal Research. 2015;49:284-287.
13. Fraser D, Pajor EA, Feddes JJR. The relationship between creep feeding behavior of piglets and adaptation to weaning: effect of diet quality. Canadian Journal of Animal Science. 1994;74:1-6.
14. Gautam VN, Shraddha Shrivastava, Lakhani GP, Baghel RPS, Kuldeep Narayan Tripathi. Effect of castration on growth performance and carcass quality in crossbred pigs. Journal of Entomology and Zoology Studies. 2018;6:1573-1576.
15. Gowrimanokari KV, Thiagarajan R, Venkataramanan R, Gopi H. Effect of inbreeding on pre-weaning and sow performance traits in Large White Yorkshire pigs. Indian Journal of Animal Research. 2018;53:997-1001.
16. Jaishankar S, Murugan M, Gopi H. Comparative pre-weaning performance of 75% large white Yorkshire crossbred pigs of fifth and sixth filial generation. International Journal of Science, Environment and Technology. 2015;4:1236-1239.
17. Jayashree PC, Sivakumar T. Influence of early weaning on productive and reproductive performance in large white yorkshire pigs. Tamilnadu Journal of Veterinary and Animal Sciences. 2013;9:207-212.
18. Kaushik P, Handique PJ, Rahman Habibur, Das Anubrata, Kr Das Anil, Bhuyan Gagan. Pre-weaning growth performance of pure and crossbred pigs under organized farm condition in Assam. International Journal of Engineering Science Invention. 2013;2:10-12.
19. Keyho K, Sabin George, Anil KS, Sasidharan M, Dipu MT, Sunanda C, *et al*. Effect of weaning age and pre-starter diet on the performance of large white Yorkshire piglets. The Pharma Innovation Journal. 2019;8:606-608.
20. Khargharia G, Zaman G, Laskar S, Das B, Aziz A, Roychoudhury R, *et al*. Phenotypic characterization and performance studies of Niang Megha and Doom pigs of North eastern India. Asian Academic Research Journal of Multidisciplinary. 2014;1:2319-2801.
21. Kumar KSV, Balasubramanyam D, Venkataramanan R, Gopi H. Production and sow performance of landrace pigs under north eastern agro climatic conditions of Tamil Nadu. Journal of Entomology and Zoology Studies. 2019;7:1201-1203.
22. Kumar SG, Mukesh S, Triveni D, Patel M, Mandal AB, Sanjay K, *et al*. Influence of indigenous galactogogue on performance of sows and piglets and related economics. Indian Journal of Animal Sciences. 2012;82:1051-1054.
23. Middelkoop A, Costermans N, Kemp B, Bolhuis JE. Feed intake of the sow and playful creep feeding of piglets influence piglet behaviour and performance before and after weaning. Scientific reports. 2019;9:1-13.
24. Narayanan R, Ronald BSM, Baegan S, Prabakaran R. Effect of age at weaning on growth performance of large white yorkshire. Tamilnadu Journal of Veterinary and Animal Sciences. 2008;4:237-239.
25. Nuntapaitoon M, Muns R, Tummaruk P. Newborn traits associated with pre-weaning growth and survival in piglets. Asian-Australas Journal of Animal Science. 2018;31:237-244.
26. Oluwole OO, Tiamiyu AK, Olorungbounmi TO, Oladele-Bukola MO, Akintoye NA. Pre-weaning growth traits in Nigerian indigenous pig crossbreds. Agricultural Sciences. 2014;5:891-896.
27. Pajor EA, Fraser D, Kramer DL. Consumption of solid food by suckling pigs: individual variation and relation to weight gain. Applied Animal Behaviour Science. 1991;32:139-155.
28. Palve S, Maitra DN, Pyne AK, Roy SK, Majumder SC. Effect of season on litter traits of Large White Yorkshire pigs in West Bengal. Indian Veterinary Journal. 2000;77:640-642.
29. Pandurangareddy P, Gnana Prakash M, Punya Kumari B, Suresh J, Alok Bharthi. Genetic analysis of pre-weaning body weights in crossbred pigs. Indian Journal of Animal Research. 2013;47:70-74.
30. Peter Jackson GG, Peter Cockcroft D. Normal Physiological Values. Clinical Examination of Farm Animals by Blackwell Science Ltd.; c2002. p. 301.
31. Prasad RMV, Jayalaxmi P, Krishna Reddy GV.

Performance of large white Yorkshire pigs in Andhra Pradesh. Indian Veterinary Journal. 2006;83:454-455.
32. Ramesh S, Sivakumar T. Comparative performance of landrace and large white yorkshire pigs under tropical maritime monsoon climate. Journal of Veterinary and Animal Science. 2009;40:42-46.
33. Ramesh V, Edwin SC, Murugan M, Vasanthakumar S. Effect of different feeding systems on growth performance and carcass traits of growing and finishing pigs. Indian Journal of Field Veterinarians. 2014;9:60-64.
34. Raseel K, Kotresh Prasad, Sunanda C. A study of seasonal variations on productive performance of cross bred pigs in high range regions of Wayanad. International Journal of Science and Nature. 2016;7:387-389.
35. Ravindra Kumar, Mandal B, Kumari N, Patel N. Performance of Different Genetic Groups of Pigs Maintained Under AICRP on Pig. International Journal of Current Microbiology and Applied Sciences. 2018;7:822-826.
36. Rokde NK, Thakur MS, Parmar SNS. Comparative performance among different genetic groups of large white yorkshire crossbred pigs. Journal of Animal Research. 2013;3:153-159.
37. Sandhu KS, Malik DS, Chandrahas, Sahoo SP, Saini AL. Effect of weight and age based split weaning on growth performances and welfare of Large White Yorkshire piglets. Indian Journal of Animal Research. 2018;52:1087-1090.
38. Sipos W, Wiener S, Entenfellner F, Sipos S. Physiological changes of rectal temperature, pulse rate and respiratory rate of pigs at different ages including the critical peripartal period. Veterinary Medicine Austria. 2013;100:96.
39. Snedecor GW, Cochran WG. Statistical methods. 8th edition. Affiliated East. West Press, New Delhi. 1994;13:1467-1473.
40. Sulabo RC, Jacela JY, Tokach MD, Dritz SS, Goodband RD, DeRouchey JM, *et al*. Effects of lactation feed intake and creep feeding on sow and piglet performance. Journal of Animal Science. 2010;88:3145-3153.
41. Sulabo RC, Tokach MD, Dritz SS, Goodband RD, DeRouchey JM, Nelssen JL. Effects of varying creep feeding duration on the proportion of pigs consuming creep feed and neonatal pig performance. Journal of Animal Science. 2010;88:3154-3162.
42. Talwar P. Effect of feeding organic and inorganic sources of additional zinc on growth performance of young piglets. M.V.Sc. Thesis. Veterinary College Bangalore, (Karnataka Veterinary, Animal and Fisheries Sciences University, Bidar), Bangalore, Karnataka, India, 2014.
43. Tissopi M, Bordoloi JP, Hussain J, Ahmed HF. Effect of feeding probiotics and milk powder supplemented creep ration on the growth performance and efficiency of feed utilization in pre-weaning piglets. Indian Journal of Animal Nutrition. 2020;37:185-190.
44. Tissopi M, Bordoloi JP, Saharia J, Kro R. A Study of Body Weight and Its Relation with Linear Body Measurements in Piglets Fed Different Feed Formulation. Agricultural Science Digest; c2019. p. 39.
45. Toi SM. Effect of Feeding Solid State Fermented Ration on the Performance of Hampshire Piglets. M.V.Sc. Thesis. College of Veterinary Science, (Assam Agricultural University), Guwahati-781022, Assam, India; c2017.