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STOCHASTIC MODEL OF HUMAN GESTATION PERIOD FOR MATURE AND PREMATURE LIVE BIRTH

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Abstract. The Gestation period or the Infecundable period of pregnancy measure from the date of conception to the date of termination of pregnancy by live birth is a useful item for the consideration in certain demographic, biological and public health problems. Bartholomew (1973) has analysed some Markov Chain Model. In this paper, the equilibrium state of human gestation period for mature and premature live birth are analysed. The demographic and biological character of mothers are discussed through the data collected from the hospitals.

1. Introduction

This paper analyzes the estimation of relative frequencies of probability of meats used in various period, extrapolates the relative proportion of meats over the long run. The hospital records 500 mothers who delivered live births are analyzed with respect to the duration of human gestation and the maturity status of the present child whether the present birth is matured or prematured.

The relevant data were obtained from government hospital, Nagercoil, Kanniyakumari District, Tamil Nadu, India from October 1, 2001 to December 31, 2001.

The hospital has good maternity facility which covers a population of 1.5 lakhs. The average number of daily out patients and inpatients is 200 and 300 respectively. This hospital also records systematically the information about various bio-demographic characteristics of the pregnant women. The premature birth is defined as a birth weight less than 2,500g and if the birth weight is greater than 2,500g it is defined as matured baby. Low birth weight is public health importance because of the strong relationship between birth weight and infant mortality and morbidity. Therefore, it is possible to study the variability during gestation period both, in the case of the mature as well as premature births. This finding is in conformity with observations made by Srinivasan et al. (1986) and Senthamarai Kannan et al. (2002).

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2. Data

During October 1, 2001 to December 31, 2001 a total of 544 pregnant cases were registered in the hospital. Among them the information about last menstrual period is not available for 44 cases, out of the remaining 500 cases the number of mature births were 379 and the number of premature births were 121.

For each of 500 mothers, the following data were collected from hospital case sheets.

- Age of the women at the time of delivery.
- Parity of the women.
- Blood group.
- Haemoglobin (HB) content.

Table 1 presents the distribution of the duration of gestation of mature birth according to the demographic and biological character of the mothers.

Table 1. Distribution of the duration of Gestation for the mature live birth by age, parity, HB contents, blood group of the mothers.

Characteristics of the mothers	Duration of Gestation (days)			
	210-238	238-266	266-280	280-308
Age				
15-19	17	5	15	14
20-24	16	48	110	16
25-29	14	24	42	11
30-above	12	3	14	18
Parity				
0	27	44	134	35
1	8	18	20	10
2	3	15	15	7
3+	10	13	13	7
HB content in grams				
7.9	4	8	1	2
8.0-9.9	20	26	16	23
10.0-11.9	18	33	160	28
12.0-13.0	6	23	5	6
Blood Group				
A	10	6	10	9
B	41	23	170	28
AB	7	8	2	15
O	30	13	0	7

Table 2 presents the distribution of the duration of gestation of premature birth according to the demographic and biological character of the mothers.

Table 2. Distribution of the duration of Gestation for the premature live birth by age, parity, HB contents, blood group of the mothers.

Characteristics of the mothers	Duration of Gestation (days)			
	210-238	238-266	266-280	280-308
Age				
15-19	1	3	11	5
20-24	4	6	40	10
25-29	2	2	7	4
30-above	2	7	14	3
Parity				
0	2	9	57	12
1	1	2	8	3
2	2	1	4	3
3+	4	6	3	4
HB Content in grams				
7.9	2	1	3	4
8.0-9.9	2	3	8	7
10.0-11.9	4	7	52	8
12.0-13.0	1	7	9	3
Blood Group				
A	1	2	11	3
B	4	9	42	11
AB	1	1	3	3
O	3	6	16	5

From Table 1 and Table 2, it can be seen that 379 births (75.80%) were matured and 121 (24.20%) were prematured. Most of the women were between 20-29 years with a major concentration towards the left side. Only about 14.8% of the women were observed bearing children after the age of 30. A low proportion of births in the age group 15-19 of the women might be due to the higher age at marriage in the Nagercoil. Chances of births to be prematured were higher at the younger ages and appeared to decrease with the increase in the age of the mother. This finding is in conformity with the observations made by Srinivasan et al. (1986) and Prithiviraj C.A. and Senthamarai Kannan K. (1998) and Senthamarai Kannan et al. (2002).

3. Equilibrium State of Gestation Period for Mature Birth

Dividing each fij element by its row-sum produces the matrix of transition probabilities, P. In Table 3, all Pij's are non negative and each rwo sums to unity. Thus, P provides the probabilities of remaining in or changing state over the period of intervals.

Table 3. Transition Matrix of the duration of Gestation for Mature Live Birth by age, parity, HB content and Blood Group of the mothers.

Characteristics of the mothers	Duration of Gestation (days)			
	210-238	238-266	266-280	280-308
Age				
15-19	.3333	.0980	.2941	.2745
20-24	.0842	.2526	.5789	.0842
25-29	.1538	.2637	.4615	.1208
30-above	.2553	.0638	.2978	.3829
Parity				
0	.1125	.1833	.5583	.1458
1	.1428	.3214	.3571	.1785
2	.0750	.3750	.3750	.1750
3+	.2325	.3023	.3023	.1627
HB content in grams				
7.9	.2666	.5333	.0666	.1333
8.0-9.9	.2352	.3058	.1882	.2705
10.0-11.9	.0753	.1380	.6694	.1171
12.0-13.0	.0251	.0962	.0209	.0251
Blood Group				
A	.2861	.1711	.2861	.2571
B	.1561	.2880	.6491	.1071
AB	.2190	.2500	.0631	.4692
O	.6000	.2600	0000	.1410

With the data transformed into these arrays we can use some matrix algebra and apply the chapman kolmogrove's theorems of Markov Chains (Kemney, 1960)

$$P^{(t+n)} = P^t \cdot P^n$$

where P^t is a row vector the ordered components of which denotes the initial probability distribution across the state P^n is the matrix of transition probability, n is an exponent indicating the number of trials.

3.1. Age group of the Mothers by mature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.2, 0.1, 0.5, 0.2).

$$P^t = (.2, .1, .5, .2)$$

$$P^2 = \begin{bmatrix} .2346 & .1542 & .3150 & .2403 \\ .1598 & .2300 & .3621 & .1465 \\ .1752 & .2110 & .4302 & .1664 \\ .2340 & .1440 & .3611 & .2580 \end{bmatrix}$$

$$P^{(t+2)} = [.1970 \quad .1870 \quad .3860 \quad .1975]$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$.3333X_1 + .0842X_2 + .1538X_3 + .2533X_4 = X_1$$
$$.0980X_1 + .2556X_2 + .2637X_3 + .0638X_4 = X_2$$
$$.2941X_1 + .5789X_2 + .4615X_3 + .2978X_4 = X_3$$
$$.2745X_1 + .0842X_2 + .1208X_3 + .3529X_4 = X_4$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.1778, .1938, .4279, .2003).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 7.5$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution do not differ significantly.

Table 4. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	59	.1778	67.38
238-266	80	.1932	73.45
266-280	181	.4279	162.14
280-308	59	.2008	75.91

3.2. Parity of the Mothers by mature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.2, 0.1, 0.5, 0.2).

$$P^t = (.2, .1, .5, .2)$$

$$P^2 = \begin{bmatrix} .1146 & .3326 & .3817 & .1705 \\ .1302 & .3173 & .3823 & .1406 \\ .1308 & .3278 & .3693 & .1753 \\ .1298 & .3022 & .4003 & .1672 \end{bmatrix}$$

$$P^{(t+2)} = [.1273 \quad .3225 \quad .3792 \quad .1692]$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$.1125X_1 + .1428X_2 + .0750X_3 + .2325X_4 = X_1$$
$$.1833X_1 + .3214X_2 + .1750X_3 + .3023X_4 = X_2$$
$$.5583X_1 + .3571X_2 + .3750X_3 + .3023X_4 = X_3$$
$$.1458X_1 + .1785X_2 + .1750X_3 + .1627X_4 = X_4$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.1283, .3207, .3803, .1705).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 37.5$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution differ significantly.

Table 5. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	48	.1185	48.62
238-266	90	.3210	121.15
266-280	182	.3793	144.13
280-308	59	.1663	64.61

3.3. Haemoglobin content of the Mothers by mature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.2, 0.1, 0.5, 0.2).

$$P^t = (.2, .1, .5, .2)$$

$$P^2 = \begin{bmatrix} .2214 & .3910 & .7930 & .2075 \\ .1893 & .4000 & .2329 & .1766 \\ .1205 & .2420 & .04937 & .1433 \\ .2070 & .3592 & .2205 & .2126 \end{bmatrix}$$

$$P^{(t+2)} = [.1648 \quad .3110 \quad .3501 \quad .1733]$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$\begin{aligned} .2666X_1 + .2352X_2 + .0753X_3 + .1500X_4 &= X_1 \\ .5333X_1 + .3058X_2 + .1380X_3 + .5750X_4 &= X_2 \\ .0666X_1 + .1880X_2 + .6694X_3 + .1250X_4 &= X_3 \\ .1333X_1 + .2705X_2 + .1178X_3 + .1500X_4 &= X_4 \end{aligned}$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.1729, .3294, .3416, .1560).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 37.43$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution differ significantly.

Table 6. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	48	.1729	65.52
238-266	90	.3294	124.84
266-280	184	.3416	129.46
280-308	59	.1560	59.12

3.4. Blood Group of mothers by mature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.2, 0.1, 0.5, 0.2).

$$P^t = (.2, .1, .5, .2)$$

$$P^2 = \begin{bmatrix} .3250 & .2020 & .2110 & .2620 \\ .2650 & .2241 & .1430 & .3681 \\ .3961 & .1982 & .2290 & .1780 \\ .2961 & .1620 & .3400 & .2020 \end{bmatrix}$$

$$P^{(t+2)} = [.3300 \quad .1900 \quad .2500 \quad .2300].$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$\begin{aligned} .286X_1 + .156X_2 + .219X_3 + .6X_4 &= X_1 \\ .171X_1 + .088X_2 + .25X_3 + .26X_4 &= X_2 \\ .286X_1 + .649X_2 + .063X_3 + 0X_4 &= X_3 \\ .257X_1 + .107X_2 + .469X_3 + .14X_4 &= X_4 \end{aligned}$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.323, .196, .234, .247).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 128.6$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution differ significantly.

Table 7. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	88	.323	122.4
238-266	50	.196	74.28
266-280	182	.234	88.68
280-308	59	.247	93.61

Table 8. Mean First Passage Time.

	Age Group	210-238	238-266	266-280	280-308
	15-19	2.5	2.8	2.2	2.4
M	20-24	2.6	1.9	2.0	3.3
	25-29	2.5	2.1	2.2	3.0
	30-above	2.8	2.8	2.0	2.2
	Parity				
	0	2.7	2.1	1.9	3.1
	1	2.5	2.1	2.4	2.8
	2	2.6	1.9	2.4	2.9
	3+	2.3	2.3	2.5	2.7
	HB content				
	7.9	2.0	2.1	3.2	2.5
	8-9.9	2.4	2.4	2.6	2.4
	10-11.9	2.8	2.1	1.6	3.3
	12-13	.3	.3	.5	.4
	Blood Group				
	A	2.51	2.65	2.34	2.48
	B	2.71	2.33	1.68	3.27
	AB	2.78	2.65	2.65	1.91
	O	1.68	3.08	3.12	2.12

Each mij element denotes the number of trials (days) it will be (on average) before a particular distribution is used.

4. Equilibrium State of Gestation Period for Premature Birth

Table 9. Transition Matrix of the Duration of Gestation Period for the premature live birth by age, parity, HB content & Blood Group of the mothers.

Characteristics of the mothers	Duration of Gestation (days)			
	210-238	238-266	266-280	280-308
Age				
15-19	.0500	.1500	.5500	.2500
20-24	.0660	.1000	.6660	.1660
25-29	.1330	.1330	.4666	.2660
30-above	.0760	.2692	.5384	.1156
Parity				
0	.0250	.1125	.7125	.1500
1	.0714	.1428	.5714	.2142
2	.2000	.1000	.4000	.3000
3+	.2352	.3529	.1764	.2352
HB Content in grams				
7.9	.2000	.1000	.3000	.4000
8.0-9.9	.1000	.1500	.4000	.3500
10.0-11.9	.0563	.0985	.7323	.1126
12.0-13.0	.0500	.3500	.4500	.1500
Blood Group				
A	.0600	.1200	.6500	.1800
B	.0601	.1400	.6400	.1700
AB	.1310	.1300	.3800	.3800
O	.1100	.2000	.5300	.1700

4.1. Age group of the Mothers by premature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.1, 0.2, 0.5, 0.2).

$$P^t = (.1, .2, .5, .2)$$

$$P^2 = \begin{bmatrix} .1045 & .1629 & .5183 & .2126 \\ .1110 & .1532 & .5026 & .2294 \\ .0970 & .1672 & .5226 & .2101 \\ .1010 & .1410 & .5345 & .2201 \end{bmatrix}$$

$$P^{(t+2)} = [.1015 \quad .1587 \quad .5205 \quad .12156].$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$\begin{aligned}
.0500X_1 + .0660X_2 + .1330X_3 + .0760X_4 &= X_1 \\
.1500X_1 + .1000X_2 + .1330X_3 + .2692X_4 &= X_2 \\
.5500X_1 + .6660X_2 + .4666X_3 + .5384X_4 &= X_3 \\
.2500X_1 + .1660X_2 + .2666X_3 + .1156X_4 &= X_4
\end{aligned}$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.0781, .1669, .5364, .2184).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 1.2$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution do not differ significantly.

Table 10. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	9	.0781	9.45
238-266	18	.1664	20.19
266-280	72	.5364	64.90
280-308	22	.2184	26.42

4.2. Parity of the Mothers by premature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.1, 0.2, 0.5, 0.2).

$$P^t = (.1, .2, .5, .1)$$

$$P^2 = \begin{bmatrix} .1863 & .1430 & .3935 & .2768 \\ .1765 & .1611 & .3988 & .2630 \\ .1626 & .1826 & .4125 & .2419 \\ .1214 & .1774 & .4812 & .2190 \end{bmatrix}$$

$$P^{(t+2)} = [.1595 \quad .1733 \quad .4216 \quad .2436].$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$\begin{aligned}
.0250X_1 + .0714X_2 + .1200X_3 + .2352X_4 &= X_1 \\
.1125X_1 + .1428X_2 + .1000X_3 + .3529X_4 &= X_2 \\
.7125X_1 + .5774X_2 + .4130X_3 + .1764X_4 &= X_3 \\
.1500X_1 + .2142X_2 + .3000X_3 + .2352X_4 &= X_4
\end{aligned}$$

and

$$X_1 + X_2 + X_3 + X_4 = 1$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.0144, .2005, .4964, .2885).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 39.2$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution differ significantly.

Table 11. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	9	.0144	1.7
238-266	18	.2005	24.2
266-280	72	.4964	60.06
280-308	22	.2885	34

4.3. HB content of Mothers by premature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.1, 0.2, 0.5, 0.2).

$$P^t = (.1, .2, .5, .1)$$

$$P^2 = \begin{bmatrix} .0868 & .2045 & .4996 & .2087 \\ .0750 & .1944 & .5403 & .1900 \\ .0679 & .1319 & .6432 & .1563 \\ .0606 & .1543 & .5519 & .2156 \end{bmatrix}$$

$$P^{(t+2)} = [.0690 \quad .1561 \quad .5900 \quad .1800].$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$\begin{aligned} .2000X_1 + .1000X_2 + .0563X_3 + .0500X_4 &= X_1 \\ .1000X_1 + .1500X_2 + .0985X_3 + .3500X_4 &= X_2 \\ .3000X_1 + .4000X_2 + .7323X_3 + .4500X_4 &= X_3 \\ .4000X_1 + .3500X_2 + .1126X_3 + .1500X_4 &= X_4 \end{aligned}$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (.06, .23, .5124, .1930).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 5.6$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution do not differ significantly.

Table 12. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	9	.06	7.26
238-266	18	.23	27.90
266-280	72	.5724	62
280-308	22	.1930	23.5

4.4. Blood Group of Mothers by premature live birth

The initial probability distribution P^t can be found by dividing the frequency of each element by the sum thus (0.1, 0.2, 0.5, 0.2).

$$P^t = (.1, .2, .5, .1)$$

$$P^2 = \begin{bmatrix} .1130 & .1430 & .4450 & .3090 \\ .1120 & .1440 & .4620 & .3070 \\ .1030 & .2850 & .5140 & .2550 \\ .1040 & .1430 & .4830 & .1880 \end{bmatrix}$$

$$P^{(t+2)} = [.1100 \quad .2100 \quad .4700 \quad .2400].$$

The ultimate equilibrium vector, P^e, contains four components, so we pre-multiply P by four component row vectors of unknown (x_1, x_2, x_3, x_4).

A system of four equation is produced plus the equation

$$X_1 + X_2 + X_3 + X_4 = 1$$

or

$$0.06X_1 + .06X_2 + .13X_3 + .1X_4 = X_1$$
$$0.12X_1 + .14X_2 + .13X_3 + .2X_4 = X_2$$
$$0.65X_1 + .64X_2 + .38X_3 + .53X_4 = X_3$$
$$0.18X_1 + .17X_2 + .38X_3 + .17X_4 = X_4$$

and

$$X_1 + X_2 + X_3 + X_4 = 1.$$

When these equations are solved simultaneously we get the equilibrium vector P^e

$$P^e = (0.100, 0.154, 0.500, 0.246).$$

This equation specifies the long term expected properties. A χ^2 test of goodness of fit with 3 degrees of freedom where

$$\chi^2 = \sum_{I=1,2,3,4} \frac{(O-E)^2}{E} = 4.94$$

and, where O = obseved frequencies, E = expected frequencies and I is the number of state, has a probability $P > 0.90$. This test shows that the expected and observed distribution do not differ significantly.

Table 13. Comparison of Expected and Actual Distribution.

Gestation Period (days)	Observed Frequency	Proportion Expected	Expected Frequency
210-238	9	.1	12.1
238-266	18	.154	18.6
266-280	72	.5	60.5
280-308	22	.246	29.7

Table 14. Mean First Passage Time.

	Age Group	210-238	238-266	266-280	280-308
	15-19	3	2.2	1.8	3
M	20-24	2.9	2.1	1.5	3.2
	25-29	2.8	2.3	1.9	2.7
	30-above	2.6	1.9	2	3.2
	Parity				
	0	2.9	2	1.5	3.3
	1	2.9	2.2	1.7	3
	2	2.8	2.6	2	2.6
	3+	2.4	2.3	2.7	2.8
	HB content				
	7.9	2.9	2.7	2.1	2.3
	8-9.9	3	2.4	2	2.6
	10-11.9	2.9	2.1	1.5	3.5
	12-13	2.7	1.9	2.3	2.9
	Blood Group				
	A	3.05	2.2	3.67	3.76
	B	2.9	2.17	3.72	3.27
	AB	3.05	2.43	2.05	2.3
	O	2.9	2.17	1.97	3.09

5. Conclusion

In this study the long term distribution of the duration of the gestation of mature and premature biological and bio-demographic characters are analysed. From this study it is observed that, for mature live birth there is no significant difference between age group and gestation period. Also it is observed that there is a significant difference between gestation period and a set of Blood group, HB and Parity. For the given data of premature live birth there is significant difference between parity and gestation period and no significant difference between gestation period and Blood group, Age group, HB content. The biological and bio-demographic characters are of vital factors in the premature live birth.

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