RESULTS

I- Biochemical Observation:-

Blood Glucose Concentration /100ml

In all groups and subgroups (control and experimental) the blood glucose concentrations were measured, tabulated and the results were analyzed as follows:-

Control Group:-

Female Animals:-

The blood glucose concentration before mating ranged from 94 to 117 with a mean value of 106.8 and standard deviation of $\pm$ 8.28.

The blood glucose concentration before they were sacrificed ranged from 82.5 to 108 with a mean value of 92.16 and standard deviation of $\pm$ 9. ***Table (1).***

Table (1):-

Blood glucose levels of female and male parent rats of control group before mating & before their sacrifice.

No.	Female		Male	
	B1	B2	B1	B2
1	108	100.5	110.5	124
2	94	86.5	128	132.5
3	107.5	103	113	126.5
4	96.5	90.5	112.5	130.5
5	109	103.5	114	119
6	112	89		
7	113	96.5		
8	94.5	84		
9	115.5	90		
10	117	108		
11	110.5	75.5		
12	99	82.5		
13	112.5	101		
14	97	98		
15	116	94		
Mean	**106.8**	**92.16**	**115.6**	**126.5**
S.D	**8.28**	**9.00**	**7.05**	**5.35**

N.B. B_1 (before mating).

B_2 (before sacrifice).

Male Animals:-

The blood glucose concentration before mating ranged from 110.5 to 128 with a mean value of 115.6 and standard deviation of ± 7.

The blood glucose concentration before they were sacrificed ranged from 119 to 132.5 with a mean value of 126.5 and standard deviation of ± 5.35 ***Table (1).***

Subgroup A (2 weeks offspring):-

The blood glucose concentration ranged from 80 to 107.5 with a mean value of 93 and standard deviation of ± 8.12.

Table (2).

Subgroup B (4 weeks offspring):-

The blood glucose concentration ranged from 93.5 to 129.5 with a mean value of 111.4 and standard deviation of ±29.5

Table (2).

Subgroup C (12 weeks offspring):-

The blood glucose concentration ranged from 84 to 141 with a mean value of 118.2 and standard deviation of ± 16.1.

Table (2).

Table (2):-

Blood glucose levels of control group offspring (2,4,12 weeks)

No.	2W	4W	12W
1	107.5	104.5	122
2	101	111.5	104
3	92	108.5	113.5
4	106	126	129
5	89.5	118.5	102
6	95.5	107	137.5
7	84.5	112	141
8	87	110	132
9	96.5	111.5	124
10	80	106.5	122.5
11	86	123.5	139
12	102.5	95	123.5
13	90.5	108	84
14	101	117	132
15	83.5	112.5	117
16	100	104	108.5
17	86.5	118	130
18	95	107	133.5
19	101	114.5	115
20	96	110	90.5
21	93.5	93.5	137.5
22	104	106	120
23	86.5	120	103.5
24	103.5	109	96.5
25	89	129.5	131.5
26	80	121	136
27	92.5	105	111
28	87	108.5	87
29	81.5	114	106.5
30	----	111.5	----
Mean	**93**	**111.4**	**118.2**
S.D	**8.12**	**29.5**	**16.1**

Group I:-

All the results of random blood glucose concentration of all male and female parent animals of this group were collectively presented in. ***Table (3).***

Female Animals:-

The blood glucose concentration before mating ranged from 259.5 to 319 with a mean value of 289.1 and standard deviation of ± 19.4.

The blood glucose concentration before they were sacrificed ranged from 272 to 357 with a mean value of 305.8 and standard deviation of ± 29.7. ***Table (3).***

Male Animals:-

The blood glucose concentration before mating ranged from 306 to 343.5 with a mean value of 327.6 and standard deviation of ± 14.29.

The blood glucose concentration before they were sacrificed ranged from 313.5 to 355 with a mean value of 339.1 and standard deviation of ± 16.39. ***Table (3).***

Table (3):-

Blood glucose levels of female and male parent rats of group I before mating & before their sacrifice.

No.	Female		Male	
	B1	B2	B1	B2
1	298	339	343.5	355
2	262.5	308	332	342.5
3	287	274.5	306	313.5
4	259.5	287.5	322	334
5	270.5	281	334.5	350.5
6	281.5	336		
7	313.5	291.5		
8	271	276.5		
9	306.5	293		
10	282	357		
11	299	345.5		
12	319	314.5		
13	277.5	272		
14	317.5			
15	292			
Mean	**289.1**	**305.8**	**327.6**	**339.1**
S.D	**19.4**	**29.7**	**14.30**	**16.40**

N.B. **B_1 (before mating).**

B_2 (before sacrifice).

Subgroup A (2 weeks offspring):-

The blood glucose concentration ranged from 52 to 93 with a mean value of 72 and standard deviation of ± 12.2.

Table (4).

Subgroup B (4 weeks offspring):-

The results of this subgroup showed that 3 from 17 offspring were diabetic and represented 17.6% so the animals were divided into diabetic and non-diabetic offspring.

Subgroup B (Diabetic):-

The blood glucose concentration ranged from 201 to 224 with a mean value of 210.5 and standard deviation of ± 12.

Table (4).

Subgroup B (Non-diabetic):-

The blood glucose concentration ranged from 118 to 161 with a mean value of 138.6 and standard deviation of ± 25.75.

Table (4).

Subgroup C (12 weeks offspring):-

The results of this subgroup showed that 4 from 18 offspring were diabetic and represented 22.2% so the animals were divided into diabetic and non-diabetic.

Subgroup C (Diabetic):-

The blood glucose concentration ranged from 210 to 264 with a mean value of 233.5 and standard deviation of $\pm$ 22.5.

Table (4).

Subgroup C (Non-diabetic):-

The blood glucose concentration ranged from 120.5 to 164.5 with a mean value of 141.5 and standard deviation of $\pm$ 33.47.

Table (4).

Table (4):-

Blood glucose levels of group I offspring (2,4,12 weeks).

No.	2 Weeks		4 Weeks		12 Weeks	
	Non-Diab.	Dia.	Non-Diab.	Diab.	Non-Diab.	Diab.
1	59.5		155.5	224	149	210
2	74		118	206.5	164.5	232.5
3	60		129.5	201	138	264
4	88.5		148.5		151	227.5
5	79.5		128		128	
6	52		136.5		164	
7	81		131.5		145	
8	60.5		155		120.5	
9	93		122.5		132	
10	71.5		161		156	
11	88		135.5		122.5	
12	82		140		123.5	
13	66		137		135	
14	70		142		157.5	
15	57					
16	77					
17	65					
Mean	**72**		**138.6**	**210.5**	**141.5**	**233.5**
S.D	**12.20**		**25.76**	**1 2**	**33.47**	**22.5**

Group II:-

Female Animals:-

The blood glucose concentration before mating ranged from 267 to 335 with a mean value of 301.9 and standard deviation of ± 23.9 .

The blood glucose concentration before they were sacrificed ranged from 276.5 to 387 with a mean value of 324 and standard deviation of ± 31.6 . ***Table (5).***

Male Animals:-

The blood glucose concentration before mating ranged from 97.5 to 122 with a mean value of 109 and standard deviation of ± 9.5

The blood glucose concentration before they were sacrificed ranged from 109.5 to 127.5 with a mean value of 116 and standard deviation of ± 7.3 . ***Table (5).***

Subgroup A (2 weeks offspring):-

The blood glucose concentration ranged from 45.5 to 90.5 with a mean value of 80.7 and standard deviation of ± 21.29.

Table (6).

Table (5):-

Blood glucose levels of female and male parent rats of group II before mating & before their sacrifice.

No.	Female		Male	
	B1	B2	B1	B2
1	281.5	301	122	119
2	330	324	115.5	127.5
3	307.5	379	97.5	113.5
4	268	291	104.5	109.5
5	325.5	300	110	111
6	293	326		
7	316.5	348		
8	300	276		
9	273	318		
10	290.5	333		
11	267.5	338		
12	335	387		
13	322.5	316		
14	331.5	299		
15	286.5	---		
Mean	**301.9**	**324**	**109**	**116**
S.D	**23.9**	**31.6**	**9.5**	**7.3**

N.B. B_1 (before mating)

B_2 (before sacrifice)

Subgroup B (4 weeks offspring):-

The results of this experiment showed that 3 from 19 offspring were diabetic and represented 15.7% and so, the animals were divided into diabetic and non-diabetic.

Subgroup B (Diabetic):-

The blood glucose concentration ranged from 213 to 238 with a mean value of 222.3 and standard deviation of $\pm$ 13.65.

Table (6).

Subgroup B (Non-diabetic):-

The blood glucose concentration ranged from 109 to 159 with a mean value of 139.5 and standard deviation of $\pm$ 34.73.

Table (6).

Subgroup C (12 weeks offspring):-

The results of this experiment showed that 3 from 20 offspring were diabetic and represented 15% and so, the animals were divided into diabetic and non-diabetic.

Subgroup C (Diabetic):-

The blood glucose concentration ranged from 211 to 270 with a mean value of 240 and standard deviatiof ± 29.5.

Table (6).

Subgroup C (Non-diabetic):-

The blood glucose concentration ranged from 117 to 159 with a mean value of 135.8. and standard deviation of ± 13.

Table (6).

Table (6):-

Blood glucose levels of group II offspring (2,4,12 weeks).

No.	2 Weeks		4 Weeks		12 Weeks	
	Non-Diab.	Dia.	Non-Diab.	Diab.	Non-Diab.	Diab.
1	79.5		108	238	127	211
2	72.5		141	216	141.5	239
3	63		122	213	154	270
4	75.5		136.5		117	
5	68		154		123	
6	54		131.5		142	
7	86.5		129		126	
8	66.5		146		119	
9	83		113		133	
10	45.5		127.5		159	
11	74		130.5		132	
12	82.5		109		124.5	
13	90.5		156		130.5	
14	78		120		142.5	
15	66		132		145	
16	76		116		136	
17	84				158	
Mean	**80.7**		**139.5**	**222.3**	**135.8**	**240**
S.D	**21.30**		**34.73**	**13.65**	**13**	**29.5**

Group III:-

Female Animals:-

The blood glucose concentration before mating ranged from 92.5 to 122 with a mean value of 107.3 and standard deviation of ± 10.1.

The blood glucose concentration before they were sacrificed ranged from 110 to 140.5 with a mean value of 122.8 and standard deviation of ± 7.32. *Table (7).*

Male Animals:-

The blood glucose concentration before mating ranged from 298.5 to 336 with a mean value of 319.1 and standard deviation of ± 14.69.

The blood glucose concentration before they were sacrificed ranged from 300.5 to 349.5 with a mean value of 335.5 and standard deviation of ± 20.12. *Table (7).*

Table (7):-

Blood glucose levels of female and male parent rats of group III before mating & before their sacrifice.

No.	Female		Male	
	B1	B2	B1	B2
1	112	125.5	317.5	343.5
2	93.5	124	330	349.5
3	97.5	126	336	337
4	109	114.5	298.5	300.5
5	121	129	313.5	347
6	96.5	120.5		
7	111	123		
8	99	128.5		
9	120.5	127		
10	113	110		
11	92.5	117.5		
12	104.5	116		
13	122	119		
14	115.5	140.5		
15	102	121		
Mean	**107.30**	**122.8**	**319.1**	**335.5**
S.D	**10.1**	**7.32**	**14.69**	**20.12**

N.B. B_1 (before mating).

B_2 (before sacrifice).

Subgroup A (2 weeks offspring):-

The blood glucose concentration ranged from 67 to 117.5 with a mean value of 88.88 and standard deviation of ± 16.4.

Table (8).

Subgroup B (4 weeks offspring):-

The blood glucose concentration ranged from 70.5 to 142 with a mean value of 106.69 and standard deviation of ± 25.49.

Table (8).

Subgroup C (12 weeks offspring):-

The blood glucose concentration ranged from 80.5 to 126 with a mean value of 103.2 and standard deviation of ± 13.

Table (8).

Table (8):-

Blood glucose levels of group III offspring (2,4,12 weeks)

No.	2 Weeks		4 Weeks		12 Weeks	
	Non-Diab.	Dia.	Non-Diab.	Diab.	Non-Diab.	Diab.
1	92		120		129.5	
2	109.5		104.5		112	
3	75.5		87.5		95.5	
4	69.5		113		89.5	
5	98		95.5		98	
6	67		122		91	
7	80.5		91		80.5	
8	116		119.5		126	
9	87		136.5		106.5	
10	96.5		70.5		114	
11	103		84.5		98.5	
12	78.5		129		93	
13	73		100.5		86.5	
14	66.5		116		109.5	
15	109.5		88.5		85.5	
16	75.5		142		90.5	
17	86		101.5		113	
18	70.5		130		107.5	
19	105.5		108.5		99.5	
20	90		72.5		104.5	
21	117.5		84		124	
22	79		131		107.5	
23	74.5		89.5		110.5	
24	114		123		104.5	
25	87.5					
Mean	**88.88**		**106.69**		**103.2**	
S.D	**16.4**		**25.49**		**13**	

From the above findings, random blood glucose concentration showed that SZ was able to induce irreversible and significant hyperglycemia ($P < 0.01$) in animals of group I, females of group II and males of group III.

Table (9).

In addition, blood glucose concentrations were significantly lower in the 2 weeks aged offspring of groups I ($P < 0.05$) and II ($P < 0.01$) and significantly higher in 4 and 12 weeks aged offspring ($P < 0.01$) when compared with the corresponding controls.

Table (10).

Table (9):-

Mean values of blood glucose levels ± the standard deviations in female and male parent rats of control and experimental groups before mating (B_1) and before sacrifice (B_2).

Group and number of animals	Female		Male	
	B1	B2	B1	B2
Control	106.8±8.3	92.2±9	115.6±7	116.5±5.4
No.	15	15	5	5
Group I	289.1±19.4	305.8±29.7	327.6±14.3	339.1±16.4
No.	15	13	5	5
Calculated t	5.15*	8.19*	7.89*	9.01*
Group II	301.9±23.9	324±31.6	109±9.6	116±7.3
No.	15	14	5	5
Calculated t	7.51*	9.92*	1.14	0.92
Group III	107.3±10.2	122.8±7.3	319.1±14.7	335.5±20.1
No.	15	15	5	5
Calculated t	0.87	1.04	7.12*	8.09*

* Denotes significantly different from the corresponding control at P <0.01.

II- Bone Marrow Observations:-

A- Chromosomal Study:

- Metaphase studies of albino rat chromosomes revealed that the number of chromosomes was 42 (40 autosomes and 2 sex chromosomes).

- The sex chromosomes in male rat were in the form of an *X* chromosome and a *Y* chromosome ***(Fig. 1 and 2).***

- The sex chromosome of female rat were similar and were composed of *XX* cell lines ***(Fig. 3 and 4).***

- The main chromosomal anomalies encountered in the present study were breaks ***(Fig. 5)***, gaps ***(Fig. 6)***, ring chromosomes ***(Fig. 7)***, dicentric chromosomes ***(Fig. 8)***, hypodiploid complements ***(Fig. 9)***, hyperdiploid complements ***(Fig. 10)*** and polyploidy ***(Fig. 11).***

Fig. (1):- Photomicrograph of normal metaphase chromosomal spread prepared from a bone marrow of a normal male albino rat. (Giemsa stain, Objective X100, Projective X10).

Fig. (2):- Karyotype of normal male albino rat prepared from Fig. (1) showing 40 autosomes and 2 sex (*XY*) chromosomes.

Fig. (3):- Photomicrograph of normal metaphase chromosomal spread prepared from a bone marrow of a normal female albino rat. (Giemsa stain, Objective X100, Projective X10).

Fig. (4):- Karyotype of normal female albino rat prepared from Fig. (3) showing 40 autosomes and 2 sex (*XX*) chromosomes.

Fig. (5):- Photomicrograph of a metaphase chromosomal spread with chromatid break (arrow).

(Giemsa Stain, Objective X100, Projective X10).

Fig. (6):- Photomicrograph of a metaphase chromosomal spread with chromatid gap (arrow).

(Giemsa stain, Objective X100, Projective X10).

Fig. (7):- Photomicrograph of a metaphase chromosomal spread with ring chromosome (arrow).

(Giemsa stain, Objective X100, Projective X10).

Fig. (9):- Photomicrograph of a metaphase chromosomal spread with hypodiploidy (41 chromosomes).

(Giemsa stain, Objective X100, Projective X10).

Fig. (10): Photomicrograph of a metaphase chromosomal spread with hyperdiploidy (43 chromosomes).
(Giemsa stain, Objective X100, Projective X10).

Fig. (11): Photomicrograph of a metaphase chromosomal spread with polydiploidy (84 chromosomes).
(Giemsa stain, Objective X100, Projective X10).

In all subgroups (control and experimental) the different chromosomal anomalies (numerical and structural) and the total cells with abnormal complements (one cell may contain more than one abnormality) were scored, tabulated and the results were analyzed as follows:-

Control Group:-

Subgroup A (2 weeks):-

The results were collectively presented in ***Table (11)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(1.9%)
Total aneuploidy	(0.4%)
Total polyploidy	(1.1%)
Total cells with abnormal chromosomes	(2.8%)

Subgroup B (4 weeks):-

The results were collectively presented in ***Table (12)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2 %)
Total aneuploidy	(0.3%)
Total polyploidy	(1.3%)
Total cells with abnormal chromosomes	(3 %)

Table (11):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 2 weeks - aged control offspring.

No	Structural Aberrations					Numerical Aberrations				Ab. c.
						Aneuploidy			Polyp	
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	0	0	1	0	1	0	0	0	1	1
2	0	1	0	1	2	0	0	0	0	2
3	1	0	0	0	1	1	1	1	0	2
4	0	0	0	1	1	0	0	0	1	1
5	1	0	0	0	1	0	0	0	1	2
6	0	0	0	0	0	0	0	0	1	1
7	0	0	0	0	0	1	1	2	0	1
8	1	0	1	0	0	0	0	0	0	2
9	1	0	0	0	2	0	0	0	1	1
10	0	1	0	0	1	0	0	0	0	2
11	0	0	0	1	1	0	0	0	1	1
12	0	0	1	0	1	0	0	0	1	2
13	0	0	1	0	1	0	0	0	1	1
14	1	0	0	0	1	0	0	0	0	1
15	0	1	0	1	2	0	0	0	0	2
16	0	0	0	0	0	0	0	0	1	1
17	0	0	0	0	0	0	1	1	0	1
18	0	0	0	1	1	0	0	0	1	2
19	1	0	0	0	1	0	0	0	1	2
20	0	0	1	0	1	0	0	0	0	1
21	1	0	0	0	1	0	0	0	1	2
22	1	1	0	0	2	0	0	0	0	1
23	0	0	1	0	1	0	0	0	0	1
24	0	0	0	0	0	1	0	1	1	2
25	1	0	0	1	2	0	0	0	0	1
26	1	0	0	0	1	0	1	0	0	1
27	0	0	1	0	1	0	0	1	1	2
28	0	0	0	0	0	0	0	1	1	1
29	0	1	0	0	1	0	0	1	1	1
Total	**10**	**5**	**7**	**6**	**28**	**3**	**3**	**6**	**6**	**41**
%	**0.7**	**0.3**	**0.5**	**0.4**	**1.9**	**0.2**	**0.2**	**0.4**	**1.1**	**2.8**

N.B. **br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).**

Table (12):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 4 Week - aged control offspring.

No	Structural Aberrations					Numerical Aberrations				Ab. c.
						Aneuploidy			Polyp	
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	0	1	0	0	1	1	0	1	0	2
2	0	1	0	1	2	0	0	0	0	1
3	0	0	1	0	1	0	0	0	1	1
4	1	1	0	0	2	0	0	0	0	2
5	0	0	0	1	1	0	0	0	1	1
6	0	0	1	0	1	0	1	1	0	2
7	1	0	0	0	1	0	0	0	1	2
8	0	1	0	0	1	0	0	0	0	1
9	0	0	1	0	1	0	0	0	1	2
10	0	0	0	1	1	0	0	0	1	2
11	1	1	0	0	2	0	0	0	0	2
12	0	0	1	0	1	0	0	0	1	1
13	0	0	0	1	1	0	0	0	1	2
14	0	0	0	0	0	0	1	1	1	1
15	1	0	0	0	1	0	0	0	2	1
16	0	1	0	0	1	0	0	0	1	2
17	0	0	0	0	0	0	0	0	0	0
18	1	0	1	0	2	0	0	0	0	2
19	0	0	0	0	0	0	0	0	1	1
20	0	0	1	0	1	0	1	1	0	2
21	0	0	0	0	0	0	0	0	2	1
22	1	0	0	0	1	0	0	0	1	2
23	0	1	0	1	2	0	0	0	0	1
24	0	0	1	0	1	0	0	0	1	2
25	0	0	0	0	0	0	0	0	1	1
26	0	1	0	0	1	1	0	1	0	2
27	1	0	0	0	1	0	0	0	1	1
28	1	0	0	0	1	0	0	0	1	2
29	1	0	1	0	2	0	0	0	0	2
30	0	0	0	0	0	0	0	0	1	1
Total	**9**	**8**	**8**	**5**	**30**	**2**	**3**	**5**	**20**	**45**
%	**0.6**	**0.5**	**0.5**	**0.3**	**2**	**0.1**	**0.2**	**0.3**	**1.3**	**3**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal celis).

Subgroup C (12 weeks):-

The results were collectively presented in ***Table (13)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2.3%)
Total aneuploidy	(0.4%)
Total polyploidy	(1 %)
Total cells with abnormal chromosomes	(3 %)

Group I:-

Subgroup A (2 weeks):-

The results were collectively presented in ***Table (14)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2 %)
Total aneuploidy	(0.5%)
Total polyploidy	(1.1%)
Total cells with abnormal chromosomes	(3.1%)

Subgroup B (4 weeks):-

The results were collectively presented in ***Table (15)*** and the precentages of chromosomal aberrations were calculated as follows:-

Table (13):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 12 Week - aged control offspring.

No	Structural Aberrations					Numerical Aberrations				Ab. c.
						Aneuploidy			Polyp	
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	0	0	0	1	1	1	0	1	0	2
2	1	0	0	0	1	0	0	0	1	1
3	0	0	1	0	1	0	0	0	0	1
4	0	1	0	0	1	0	0	0	0	1
5	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	1	1
7	0	1	0	1	2	0	0	0	0	2
8	1	0	1	0	2	0	0	0	0	1
9	0	0	1	0	1	0	0	0	1	2
10	1	1	0	0	2	0	0	0	0	2
11	0	0	0	0	0	0	0	0	1	1
12	0	0	1	0	1	2	0	2	1	2
13	0	0	0	0	0	0	1	1	0	1
14	1	1	0	0	2	0	0	0	0	2
15	0	1	0	0	1	0	0	0	1	2
16	0	0	1	1	2	0	0	0	0	2
17	1	0	0	0	1	0	0	0	1	1
18	0	0	1	0	1	0	0	0	1	2
19	0	1	0	0	1	0	0	0	1	2
20	1	0	0	1	2	0	0	0	0	1
21	1	0	0	0	1	0	0	0	1	2
22	1	1	0	0	2	0	0	0	0	1
23	0	0	0	1	1	0	0	0	1	1
24	1	1	0	0	2	0	0	0	0	2
25	0	0	1	0	1	0	0	0	1	2
26	0	1	0	0	1	1	0	1	0	1
27	0	1	0	0	1	0	0	0	1	1
28	1	0	0	1	2	0	0	0	0	2
29	0	0	0	0	0	0	1	1	1	2
Total	**10**	**10**	**7**	**6**	**33**	**4**	**2**	**6**	**14**	**43**
%	**0.7**	**0.7**	**0.5**	**0.4**	**2.3**	**0.3**	**0.1**	**0.4**	**1**	**3**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

Table (15):-

Chromosomal anomalies encountered in 50 examined/ metaphases/ rat in 4 weeks - aged Group I. Non-Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				Ab. c.
						Aneuploidy			Polyp	
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
			0							
1	1	0	1	0	1	0	0	0	1	2
2	0	0	1	0	1	0	0	0	0	1
3	0	1	0	0	2	0	0	0	0	2
4	1	0	0	0	1	0	1	1	0	1
5	1	0	0	1	2	0	0	0	0	2
6	0	0	0	0	0	1	0	1	0	1
7	1	0	0	0	1	0	0	0	1	1
8	0	0	0	0	0	0	0	0	1	1
9	1	0	0	1	2	0	0	0	0	2
10	0	0	0	0	1	1	0	1	0	2
11	0	0	0	0	0	0	1	1	0	1
12	0	1	0	0	1	0	0	0	1	2
13	1	0	0	0	1	0	0	0	2	2
14	0	0	0	1	1	0	0	0	1	2
Total	**6**	**2**	**3**	**3**	**14**	**2**	**2**	**4**	**7**	**22**
%	**0.9**	**0.3**	**0.4**	**0.4**	**2**	**0.3**	**0.3**	**0.6**	**1**	**3.1**

Chromosomal anomalies encountered in 50 examined metaphases/rat in 4 weeks - aged Group I. Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				Ab. c.
						Aneuploidy			Polyp	
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
15	1	0	0	0	1	0	0	0	1	2
16	1	1	1	0	3	0	1	1	0	2
17	0	1	0	0	1	0	0	0	0	2
Total	**2**	**2**	**1**	**0**	**5**	**0**	**1**	**1**	**1**	**6**
%	**1.3**	**1.3**	**0.7**	**0**	**3.3**	**0**	**0.7**	**0.7**	**0.7**	**4**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

Subgroup B Diabetic:-

Total structural abnormalities	(3.3%)
Total aneuploidy	(0.7%)
Total polyploidy	(0.7%)
Total cells with abnormal chromosomes	(4%)

Subgroup B Non-Diabetic:-

Total structural abnormalities	(2 %)
Total aneuploidy	(0.6%)
Total polyploidy	(1 %)
Total cells with abnormal chromosomes	(3.1%)

Subgroup C (12 weeks):-

The results were collectively presented in ***Table (16)*** and the precentages of chromosomal aberrations were calculated as follows:-

Subgroup C Diabetic:-

Total structural abnormalities	(3 %)
Total aneuploidy	(0.5%)
Total polyploidy	(1 %)
Total cells with abnormal chromosomes	(3.5%)

Subgroup C Non-Diabetic:-

Total structural abnormalities	(2.1%)
Total aneuploidy	(0.6%)
Total polyploidy	(1.1%)
Total cells with abnormal chromosomes	(3.3%)

Table (16):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 12 weeks - aged Group I. Non-Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	1	0	1	0	2	0	0	0	1	2
2	0	0	0	1	1	0	0	0	1	2
3	0	0	0	0	0	0	1	1	1	1
4	0	1	0	0	1	1	0	1	0	2
5	0	0	1	1	2	0	0	0	0	2
6	0	1	0	0	1	0	1	1	0	1
7	0	1	0	0	1	0	0	0	1	2
8	0	0	0	0	0	0	0	0	1	1
9	1	0	0	1	2	0	0	0	0	2
10	0	0	1	0	2	0	0	0	0	1
11	0	1	0	0	1	1	0	1	0	2
12	0	0	0	1	1	0	0	0	1	2
13	0	0	0	0	0	0	0	0	1	1
14	1	0	0	0	1	0	0	0	1	2
Total	**4**	**4**	**3**	**4**	**15**	**2**	**2**	**4**	**8**	**23**
%	**0.6**	**0.6**	**0.4**	**0.6**	**2.1**	**0.3**	**0.3**	**0.6**	**1.1**	**3.3**

Chromosomal anomalies encountered in 50 examined metaphases/rat in 12 weeks - aged Group I. Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
15	1	0	0	1	2	0	0	0	0	2
16	1	1	0	0	2	0	0	0	1	2
17	0	0	0	0	0	0	0	0	1	1
18	1	0	1	0	2	1	0	1	0	2
Total	**3**	**1**	**1**	**1**	**6**	**1**	**0**	**1**	**2**	**7**
%	**1.5**	**0.5**	**0.5**	**0.5**	**3**	**0.5**	**0**	**0.5**	**1**	**3.5**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

Group II:-

Subgroup A (2 weeks):-

The results were collectively presented in ***Table (17)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2.1%)
Total aneuploidy	(0.5%)
Total polyploidy	(1.1%)
Total cells with abnormal chromosomes	(2.9%)

Subgroup B (4 weeks):-

The results were collectively presented in ***Table (18)*** and the precentages of chromosomal aberrations were calculated as follows:-

Subgroup B Diabetic:-

Total structural abnormalities	(2.7%)
Total aneuploidy	(0.7%)
Total polyploidy	(0.7%)
Total cells with abnormal chromosomes	(4 %)

Table (18):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 4 weeks - aged Group II. Non-Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	1	0	0	0	1	1	0	1	1	1
2	0	0	0	1	1	0	0	0	1	2
3	0	1	0	0	1	0	0	0	1	2
4	0	0	0	0	0	0	1	1	0	2
5	1	0	1	1	2	0	0	0	0	1
6	0	0	0	0	1	0	0	0	1	2
7	0	0	0	0	0	0	1	1	0	2
8	1	1	0	0	2	0	0	0	0	2
9	1	0	0	0	1	0	0	0	1	2
10	1	0	0	0	1	1	0	1	1	2
11	0	0	0	0	0	0	0	0	1	1
12	0	0	0	1	1	0	0	0	0	2
13	0	0	1	0	1	0	0	0	0	1
14	0	0	1	0	1	0	0	0	1	2
15	0	1	1	0	2	0	0	0	1	1
16	1	0	0	0	1	0	0	0	1	2
Total	6	3	4	3	16	2	2	4	10	27
%	0.8	0.4	0.5	0.4	2	0.3	0.3	0.5	1.3	3.4

Chromosomal anomalies encountered in 50 examined metaphases/rat in 4 weeks - aged Group II. Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
17	1	0	0	0	1	0	0	0	1	2
18	0	1	0	0	1	0	0	0	0	1
19	1	1	0	0	2	1	0	1	0	3
Total	2	2	0	0	4	1	0	1	1	6
%	1.3	1.3	0	0	2.7	0.7	0	0.7	0.7	4

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

Subgroup B Non-Diabetic:-

Total structural abnormalities	(2 %)
Total aneuploidy	(0.5%)
Total polyploidy	(1.3%)
Total cells with abnormal chromosomes	(3.4%)

Subgroup C (12 weeks):-

The results were collectively presented in ***Table (19)*** and the precentages of chromosomal aberrations were calculated as follows:-

Subgroup C Diabetic:-

Total structural abnormalities	(2.7%)
Total aneuploidy	(0.7%)
Total polyploidy	(1.3%)
Total cells with abnormal chromosomes	(4.7%)

Subgroup C Non-Diabetic:-

Total structural abnormalities	(2.1%)
Total aneuploidy	(0.5%)
Total polyploidy	(1.3%)
Total cells with abnormal chromosomes	(3.4%)

Table (19):-

Chromosomal anomalies encountered in 50 examined metaphases/rat in 12 weeks - aged Group II. Non-Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	0	1	0	0	1	0	0	0	1	2
2	0	0	0	1	1	1	0	1	1	2
3	1	0	0	0	1	0	1	1	0	2
4	0	0	1	0	1	0	0	0	1	1
5	0	1	0	0	1	0	0	0	1	2
6	1	0	0	0	1	0	0	0	0	1
7	0	1	1	0	2	0	0	0	0	1
8	1	0	0	0	1	0	0	0	1	2
9	0	0	1	0	1	0	0	0	1	2
10	0	0	0	1	1	1	0	1	1	3
11	0	0	0	0	0	0	0	0	2	2
12	1	0	1	0	2	0	0	0	0	1
13	0	1	0	0	1	0	0	0	1	2
14	1	0	0	0	1	0	0	0	1	2
15	0	1	0	0	1	0	0	0	0	1
16	1	0	0	0	1	0	1	1	0	2
17	0	1	0	0	1	0	0	0	0	1
Total	**6**	**6**	**4**	**2**	**18**	**2**	**2**	**4**	**11**	**29**
%	**0.7**	**0.7**	**0.5**	**0.2**	**2.1**	**0.2**	**0.2**	**0.5**	**1.3**	**3.4**

Chromosomal anomalies encountered in 50 examined metaphases/rat in 12 weeks - aged Group II. Diabetic offspring.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
18	1	1	0	0	2	0	0	0	1	3
19	0	1	0	0	1	0	0	0	1	2
20	1	0	0	0	1	1	0	1	0	2
Total	**2**	**2**	**0**	**0**	**4**	**1**	**0**	**1**	**2**	**7**
%	**1.3**	**1.3**	**0**	**0**	**2.7**	**0.7**	**0**	**0.7**	**1.3**	**4.7**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

Group III:-

Subgroup A (2 weeks):-

The results were collectively presented in ***Table (20)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2 %)
Total aneuploidy	(0.5%)
Total polyploidy	(1 %)
Total cells with abnormal chromosomes	(3 %)

Subgroup B (4 weeks):-

The results were collectively presented in ***Table (21)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2.1%)
Total aneuploidy	(0.4%)
Total polyploidy	(1.3%)
Total cells with abnormal chromosomes	(3.3%)

Table (20):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 2 Week - aged Group III Offsping.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	1	0	0	0	1	1	0	1	0	1
2	0	0	1	0	1	0	0	0	1	2
3	0	1	0	0	1	0	0	0	0	1
4	0	0	1	0	1	0	0	0	1	2
5	1	0	0	0	1	0	1	1	0	2
6	0	1	0	0	1	0	0	0	1	1
7	0	1	0	0	1	0	0	0	1	2
8	1	0	1	0	2	0	0	0	0	2
9	0	0	0	1	1	0	0	0	1	1
10	0	0	1	0	1	0	0	0	1	2
11	0	0	0	1	1	0	0	0	1	2
12	1	1	0	0	2	0	1	1	0	2
13	0	0	0	0	0	0	0	0	1	1
14	0	0	1	0	1	0	0	0	0	1
15	1	0	0	0	1	0	0	0	1	2
16	1	0	0	0	1	0	0	0	0	1
17	0	0	0	0	0	1	0	1	1	1
18	1	0	0	1	2	0	0	0	0	2
19	0	0	1	0	1	0	0	0	0	1
20	1	0	0	0	1	0	1	1	0	1
21	0	1	0	0	1	0	0	0	1	2
22	0	0	0	0	0	0	0	0	1	1
23	1	0	0	0	1	0	0	0	1	2
24	0	1	0	1	2	0	0	0	0	1
25	0	0	0	0	0	1	0	1	0	1
Total	**9**	**6**	**6**	**4**	**25**	**3**	**3**	**6**	**13**	**37**
%	**0.7**	**0.5**	**0.5**	**0.3**	**2**	**0.2**	**0.2**	**0.5**	**1**	**3**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoi), Ab. c (Abnormal cells).

Table (21):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 4 Week - aged Group III Offsping.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	0	1	0	0	1	0	0	0	1	1
2	1	0	1	0	2	0	0	0	0	2
3	1	0	0	0	1	0	1	1	1	2
4	0	1	0	0	1	0	0	0	1	2
5	1	0	0	0	1	0	0	0	1	2
6	0	0	1	0	1	0	0	0	1	2
7	0	0	0	1	1	0	1	1	0	2
8	1	0	0	0	1	1	0	1	0	2
9	1	0	0	0	1	0	0	0	1	2
10	1	0	0	1	2	0	0	0	1	1
11	0	1	0	0	1	0	0	0	0	1
12	0	0	0	0	0	1	0	1	1	2
13	1	1	0	0	2	0	0	0	0	2
14	0	0	0	0	0	0	0	0	1	1
15	1	0	0	0	1	0	0	0	1	2
16	0	0	0	0	0	0	0	0	1	1
17	0	0	1	0	1	0	0	0	1	2
18	1	0	0	0	1	0	0	0	1	1
19	0	0	0	1	1	0	0	0	1	2
20	0	0	1	0	1	0	0	0	0	1
21	0	1	0	0	1	1	0	1	0	2
22	1	0	0	1	2	0	0	0	0	1
23	0	0	1	0	1	0	0	0	1	1
24	0	0	1	0	1	0	0	0	1	2
Total	**10**	**5**	**6**	**4**	**25**	**3**	**2**	**5**	**16**	**39**
%	**0.8**	**0.4**	**0.5**	**0.3**	**2.1**	**0.3**	**0.2**	**0.4**	**1.3**	**3.3**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

Subgroup C (12 weeks):-

The results were collectively presented in ***Table (22)*** and the precentages of chromosomal aberrations were calculated as follows:-

Total structural abnormalities	(2 %)
Total aneuploidy	(0.4%)
Total polyploidy	(1.1%)
Total cells with abnormal chromosomes	(3 %)

The statistical analysis of the chromosomal study in control subgroups versus experimental subgroups revealed non-significant differences at $P < 0.05$.

Table (22):-

Chromosomal anomalies encountered in 50 examined metaphases/ rat in 12 Week - aged Group III Offsping.

No	Structural Aberrations					Numerical Aberrations				
						Aneuploidy			Polyp	Ab. c.
	br	gap	ring	Dicen.	T.str	hypo	hyper	T.aneu		
1	1	0	0	0	1	0	1	1	0	1
2	0	0	1	0	1	0	0	0	1	1
3	0	0	0	1	1	0	0	0	1	2
4	1	0	0	0	1	1	0	1	0	2
5	0	1	0	0	1	0	0	0	0	1
6	0	0	0	0	0	0	0	0	1	1
7	0	1	0	1	2	0	0	0	0	2
8	1	0	0	0	1	0	0	0	1	1
9	1	0	0	0	1	0	0	0	1	2
10	1	0	1	0	2	0	0	0	0	2
11	0	0	0	1	1	0	0	0	0	1
12	0	0	0	0	0	0	0	0	1	1
13	0	0	0	0	0	1	0	1	1	2
14	0	0	1	0	1	0	0	0	1	2
15	1	0	0	0	1	0	0	0	2	2
16	0	1	0	1	2	0	0	0	0	2
17	0	1	0	0	1	0	0	0	1	1
18	1	1	0	0	2	0	0	0	0	1
19	0	0	1	0	1	0	0	0	0	2
20	0	1	1	0	2	0	0	0	0	1
21	0	0	0	0	0	1	0	1	1	2
22	0	0	0	1	1	0	0	0	1	2
23	1	0	0	0	1	0	0	0	0	1
24	0	0	0	0	0	0	1	1	0	1
Total	**8**	**6**	**5**	**5**	**24**	**3**	**2**	**5**	**13**	**36**
%	**0.7**	**0.5**	**0.4**	**0.4**	**2**	**0.3**	**0.2**	**0.4**	**1.1**	**3**

N.B. br. (break), Dicent. (Dicentric), T.str. (Total structural), hypo (hypodiploidy), hyper (hyperdiploidy), Poly. (Polypoidy), Ab. c (Abnormal cells).

B- Proliferation Index

In all subgroups (control and experimental) the transformed cell percentages were scored tabulated and the results were analyzed as follows:-

Control Group:-

Subgroup A (2 weeks):-

The transformed cell percentage ranged from 16.2% to 22.4% with a mean value of 20.12%. ***Table (23).***

Subgroup B (4 weeks):-

The transformed cell percentage ranged from 16.8% to 22.2% with a mean value of 19.93%. ***Table (23).***

Subgroup C (12 weeks offspring):-

The transformed cell percentage ranged from 16.4% to 21.6% with a mean value of 19.43%. ***Table (23).***

Table (23):-

Number and percentage of transformed cells /500 examined cells in bone marrow smears of each rat of control group offspring *(at 2,4,12 weeks).*

No.	2 Weeks		4 Weeks		12 Weeks	
	no	%	no	%	no	%
1	102	20.40	107	21.40	100	20.00
2	108	21.60	101	20.20	104	20.00
3	105	21.00	103	20.60	99	19.80
4	99	19.00	97	19.40	91	18.20
5	93	18.60	91	18.20	103	20.60
6	104	20.80	102	20.40	87	17.40
7	112	22.40	110	22.00	94	18.80
8	86	17.20	84	16.80	96	19.20
9	102	20.40	100	20.00	106	21.20
10	81	16.20	94	18.80	97	19.40
11	104	20.80	108	21.60	92	18.40
12	100	20.00	98	19.60	98	19.60
13	102	20.40	101	20.20	82	16.40
14	92	18.40	89	17.80	108	21.60
15	107	21.40	105	21.00	100	20.00
16	93	18.60	93	18.60	89	17.80
17	101	20.20	99	19.80	95	19.00
18	105	21.00	111	22.20	105	21.00
19	108	21.60	106	21.20	93	18.60
20	104	20.80	102	20.40	105	21.00
21	106	21.20	104	20.80	101	20.20
22	100	20.00	108	21.60	105	21.00
23	97	19.40	106	21.20	87	17.40
24	108	21.60	98	19.60	89	17.80
25	100	20.00	85	17.00	83	16.60
26	87	17.40	91	18.20	96	19.20
27	103	20.60	89	17.80	105	21.00
28	100	20.00	107	21.40	102	20.40
29	109	21.80	103	20.60	106	21.20
30			97	19.40		
Total	**2918.00**		**2989**		**2818**	
mean %		**20.12**		**19.93**		**19.43**

Group I:-

Subgroup A (2 weeks):-

The transformed cell percentage ranged from 17% to 21% with a mean value of 18.75%. *Table (24).*

Subgroup B - Diabetic:-

The transformed cell percentage ranged from 15.4% to 17.2% with a mean value of 16.33%. *Table (24).*

Subgroup B (Non-diabetic):-

The transformed cell percentage ranged from 17.4% to 21.4% with a mean value of 19.11%. *Table (24).*

Subgroup C (Diabetic):-

The transformed cell percentage ranged from 14.4% to 16.2% with a mean value of 15.6 %. *Table (24).*

Subgroup C (Non-Diabetic):-

The transformed cell percentage ranged from 16.8% to 21 % with a mean value of 19.06%. *Table (24).*

Table (24):-

Number and percentage of transformed cells /500 examined cells in bone marrow smears of each rat of Group I. offspring *(at 2,4,12 weeks).*

No.	2 Weeks		4 Weeks				12 Weeks			
			non-diab.		diab.		non-diab.		diab.	
	no	%	no	%	no	%	no	%	no	%
1	95	19.00	100	20.00	77	15.40	92	18.40		
2	88	17.60	94	18.80	82	16.40	94	18.80	80	16.00
3	97	19.40	88	17.60	86	17.20	84	16.80	79	15.80
4	93	18.60	101	20.20			99	19.80	72	14.40
5	95	19.00	107	21.40			88	17.60	81	16.20
6	85	17.00	89	17.80			93	18.60		
7	100	20.00	96	19.20			86	17.20		
8	86	17.20	93	18.60			104	20.80		
9	94	18.80	102	20.40			96	19.20		
10	87	17.40	87	17.40			105	21.00		
11	105	21.00	97	19.40			101	20.20		
12	97	19.40	95	19.00			97	19.40		
13	86	17.20	99	19.80			95	19.00		
14	92	18.40	90	18.80			100	20.00		
15	98	19.60								
16	96	19.20								
17	100	20.00								
Total	**1594**		**1338**		**245**		**1345**		**312**	
mean %		**18.75**		**19.11**		**16.33**		**19.06**		**15.60**

Group II:-

Subgroup A (2 weeks):-

The transformed cell percentage ranged from 16.6% to 21.2% with a mean value of 19.3%. ***Table (25).***

Subgroup B - Diabetic:-

The transformed cell percentage ranged from 15.6% to 17.7% with a mean value of 16.6%. ***Table (25).***

Subgroup B (Non-diabetic):-

The transformed cell percentage ranged from 16.8% to 24% with a mean value of 19.73%. ***Table (25).***

Subgroup C (Diabetic):-

The transformed cell percentage ranged from 14.2% to 16.4% with a mean value of 15.2%. ***Table (25).***

Subgroup C (Non-Diabetic):-

The transformed cell percentage ranged from 15.8% to 20.8% with a mean value of 18.68%. ***Table (25).***

Table (25):-

Number and percentage of transformed cells /500 examined cells in bone marrow smears of each rat of Group II. offspring *(at 2,4,12 weeks).*

No.	2 Weeks		4 Weeks				12 Weeks			
			non-diab.		diab.		non-diab.		diab.	
	no	%	no	%	no	%	no	%	no	%
1	90	18.00	91	18.20	88	17.60	104	20.80	71	14.20
2	105	21.00	105	21.00	78	15.60	88	17.60	82	16.40
3	96	19.20	90	18.00	83	16.60	93	18.60	75	15.00
4	83	16.60	100	20.00			87	17.40		
5	89	17.80	98	19.60			99	19.80		
6	87	17.40	102	20.40			79	15.80		
7	104	20.80	89	17.80			97	19.40		
8	101	20.20	100	20.00			92	18.40		
9	102	20.40	84	16.80			96	19.20		
10	106	21.20	120	24.00			89	17.80		
11	96	19.20	101	20.20			95	19.00		
12	105	21.00	92	18.40			94	18.80		
13	95	19.00	97	19.40			89	17.80		
14	93	18.60	103	20.60			92	18.40		
15	86	17.20	99	19.80			98	19.60		
16	102	20.40	107	21.40			95	19.00		
17	90	18.00					101	20.20		
18	98	19.60								
19	103	20.60								
20	99	19.80								
Total	**1930**		**1578**		**249**		**1588**		**228**	
mean %		**19.30**		**19.73**		**16.60**		**18.68**		**15.20**

Group III:-

Subgroup A (2 weeks):-

The transformed cell percentage ranged from 17% to 23% with a mean value of 20.02%. ***Table (26).***

Subgroup B (4 Weeks):-

The transformed cell percentage ranged from 16.4% to 21.8% with a mean value of 19.43%. ***Table (26).***

Subgroup B (12 Weeks):-

The transformed cell percentage ranged from 16.8% to 21.6% with a mean value of 19.6%. ***Table (26).***

Table (26):-

Number and percentage of transformed cells /500 examined cells in bone marrow smears of each rat of Group III. offspring *(at 2,4,12 weeks).*

No.	2 Weeks		4 Weeks		12 Weeks	
	no	%	no	%	no	%
1	97	19.40	88	17.60	93	18.60
2	94	18.80	104	20.80	107	21.40
3	110	22.00	99	19.80	101	20.20
4	85	17.00	101	20.20	97	19.40
5	105	21.00	96	19.20	104	20.80
6	86	17.20	89	17.80	89	17.80
7	94	18.80	100	20.00	100	20.00
8	98	19.60	109	21.80	84	16.80
9	106	21.20	82	16.40	108	21.60
10	102	20.40	98	19.60	102	20.40
11	99	19.80	96	19.20	91	18.20
12	95	19.00	102	20.40	98	19.60
13	101	20.20	95	19.00	101	20.20
14	96	19.20	99	19.80	99	19.80
15	108	21.60	105	21.00	104	20.80
16	97	19.40	91	18.20	90	18.00
17	103	20.60	94	18.80	87	17.40
18	115	23.00	86	17.20	108	21.60
19	96	19.20	102	20.40	106	21.20
20	108	21.60	97	19.40	101	20.20
21	99	19.80	100	20.00	97	19.40
22	97	19.40	103	20.60	94	18.80
23	102	20.40	95	19.00	86	17.20
24	109	21.80	101	20.20	105	21.00
25	101	20.20				
Total	**2503**		**2332**		**2352**	
mean %		**20.02**		**19.43**		**19.60**

The statistical comparison of the results of the offspring of the different subgroups showed that diabetic offspring exhibited significantly lower proliferation indices when compared with their age-corresponding controls. However, non-diabetic, though hyperglycemic, offspring showed non-significant differences from their age corresponding controls as shown in ***Table (27).***

Table (27):-

Mean number and percentage of transformed cells in different aged offspring of control and experimental groups.

Group	2 Weeks				4 Weeks				12 Weeks			
	diab.		non-diab.		diab.		non-diab.		diab.		non-diab.	
	no	%	no	%	no	%	no	%	no	%	no	%
Control			2918	20.12			2892	19.93			2818	19.43
Group I. Z			1594	18.75 1.546	245	16.33 3.35	1338	19.1 1.41	312	15.6 4.1	1334	19.06 0.65
Group II. Z			1930	19.3 1.723	249	16.6 3.09	1578	19.73 0.36	228	15.2 3.97	1558	18.68 1.39
Group III. Z			2503	20 0.345			2332	19.4 10.01			2352	19.5 0.33

N.B. D. (Diabetic).

ND. (Non-diabetic).

* Denotes significantly different from the corresponding control at (Z >1.96).

III- Histological Observations:-

Microscopic examination of histological changes in the pancreatic islets and different cell types of the islets in the different groups of control and experimental animals was carried out.

The islets of Langerhans in control adult rat showed that α cells formed a thin and incomplete cortical layer at the peripheral zone. The main mass of the islets appeared to consist of β cells arranged in pattern of interlacing cords interpenetrated by blood sinusoids ***(Fig. 12).***

Figure 12 also shows that β cell nuclei are larger in diameter and vesicular in appearance when compared with the relatively heterochromatic nuclei of α cells.

The preponderance of β cells was found to be a postnatal event as there was a relatively low percentage of β cells in sections obtained from immature control animals of 2 weeks age ***(Fig. 13),*** which relatively increased at the age of 4 weeks ***(Fig. 14).***

This gradual increase in the relative percentage of β cells in the early few weeks of postnatal life was emphasized by the quantitative study ***Table (28).***

On the other hand, α cells exhibited a marked tendency to coalesce together ***(Fig. 15).*** Eosinophilia of α cell cytoplasm was marked in adult ages especially in diabetic animals due to increase accumulation of α-cell secretion ***(Fig. 16).***

In 2 weeks-aged offspring of diabetic mothers, α cells existence appeared to be negligible ***(Fig. 17)*** and thenceafter they started to show a relative increase in sections obtained from 4 weeks-aged offspring whether diabetic ***(Fig. 18)*** or non-diabetic hyperglycemic ***(Fig. 19).***

Again, the relative increase of α-cells was pronounced with maturing age of the 12 weeks aged offspring whether diabetic ***(Fig. 20)*** or non-diabetic hyperglycemic ***(Fig. 21)*** due to the degenerative changes of β-cells.

The degree of degenerative changes in β cells depended on the age and the level of blood glucose whether hyperglycemic non-diabetic (> 120mg/dL < 200 mg/dL) or diabetic (> 200mg/dL) as shown by ***Fig. 17-21.***

Degenerative changes started with pyknosis and karyorrhexis of β-cells nuclei ***(Fig. 16)***, accumulation of watery droplets inside their cytoplasm (hydropic degeneration) and lastly balloning of β cells with complete loss leaving enormous cavitations occuping their places ***(Fig. 22 & 23).***

Table (37) shows that the average diameter of β-cells nuclei was significantly increased in offspring of diabetic mothers.

The quantitative data presented in ***Table (32)*** emphasize the significant decrease in β cells precentage with advancement of age in offspring of diabetic mothers.

Table (37) shows that the diameter of β cells nuclei was increased in offspring of diabetic mothers.

Fig. (12):- A section of control adult islet of Langerhans showing the peripheral localization of α-cell groups (small arrows) and the central localization of β-cell with many blood sinusoids (large arrows). Not the vesicular large nuclei of β-cell.

chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (13):- A section of control islet at the age of 2 weeks showing the relatively low percentage of β cells. Alpha cells occupy a peripheral zone (arrows).

chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (14):- A section of control islet at the age of 4 weeks showing the relative recess of α cells percentage (arrows) due to the increase of β cells number.

chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (15):- A section of control adult islet showing α cells tend to coalesce together (arrows).
chromium-haematoxylin and phloxine, Proj. 10X, Obj. 100X.

Fig. (16):- A section of diabetic adult islet showing eosinophilia of α-cell cytoplasm and some karyorrhexic and pyknotic changes of β-cells nuclei (arrows).

chromium-haematoxylin and phloxine, Proj. 10X, Obj. 100X.

Fig. (17):- A section in islet of 2 weeks-aged offspring of diabetic mother showing very few α cells (arrows) and some degree of β cell degeneration (cavitation).
chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (18):- A section in islet of 4 weeks-aged diabetic offspring showing marked eosinophilia of α cell cytoplasms (arrows) and more cavitations due to β cells loss.
chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (19):- A section in islet of 4 weeks-aged non-diabetic hyperglycemic offspring showing degenerative changes of β cell. Note that α cell cytoplasm are less eosinophilic.
chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (20):- A section in islet of 12 weeks-aged diabetic offspring showing severe cavitation due to β cell loss. Note the striking eosinophilia in α cell cytoplasm (arrows).
chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (21):- A section in islet of 12 weeks-aged non-diabetic hyperglycemic offspring showing less eosinophilia of α cell and less degenerative changes (cavitations) in β cells in comparison to ***Fig. 20.***

chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (22):- A section of diabetic adult islet showing pyknotic nuclei of β cells with enormous cavitations at the sites of lost β cells. chromium-haematoxylin and phloxine, Proj. 10X, Obj. 40X.

Fig. (23):- A higher magnification of ***Fig. 22*** showing intact α cell nuclei (top left).

chromium-haematoxylin and phloxine, Proj. 10X, Obj. 100X.

IV. Quantitation and Morphometic Study.

A- Determination of β-cell Percentage.

Control Group:-

The results of subgroups A, B and C of this experiment were collectively presented in, *Table (28).*

Subgroup A (2 weeks):-

The β-cell percentage ranged from 51.8% to 68.1% with a mean value of 62.09% and S.D of ± 4.49,

Table (28).

Subgroup B (4 weeks):-

The β-cell percentage ranged from 65.5% to 79.7% with a mean value of 73.57% and S.D. of ± 3.87,

Table (28).

Subgroup C (12 weeks):-

The β-cell percentage ranged from 66.4% to 81.1% with a mean value of 74.01% and S.D. of ± 4.25,

Table (28).

Table (28):-

Percentags of Pancreatic β-cells in Control Group offspring at 2, 4 and 12 weeks.

No.	2W	4W	12W
1	63.7	76.3	79.6
2	65.1	77.9	76.2
3	60.4	72.3	73.6
4	67.1	71	75.4
5	62.5	77.1	81.1
6	60.3	75.4	74.3
7	53.6	72.2	69.8
8	74.3	74.7	75
9	62.4	67.1	77.2
10	64.2	76.6	67.5
11	51.8	65.8	79.6
12	61	69.3	78.8
13	58.1	70	72.7
14	67	77.2	73
15	59.6	70.5	78.5
16	64	62.6	76.1
17	66.3	73.4	66.4
18	61.7	77	77.3
19	58.6	72.3	68.7
20	63	78.6	75
21	52.4	75.2	73.8
22	68.1	72	70.2
23	62.8	74.4	80.6
24	64.3	79.7	77.3
25	66.7	75.1	69.5
26	65.5	78	71.6
27	54.7	65.5	69
28	63.5	76.2	69.3
29	67	74.2	68.2
30		67.4	
Mean	**62.09**	**73.57**	**74.01**
S.D	**4.49**	**3.87**	**4.25**

Group I:-

The results of subgroups A, B and C of this experiment were collectively presented in, ***Table (29).***

Subgroup A (2 weeks):-

The β-cell percentage ranged from 64.8% to 89.8% with a mean value of 78.04% and S.D. of ± 8.01,

Subgroup B Diabetic:-

The β-cell percentage ranged from 55.4% to 46.7% with a mean value of 51% and S.D. of ± 4.35,

Subgroup B Non-Diabetic:-

The β-cell percentage ranged from 53.7% to 78.2% with a mean value of 64.08% and S.D. of ± 8.66,

Subgroup C Diabetic:-

The β-cell percentage ranged from 41.1% to 48.5% with a mean value of 44.63% and S.D. of ± 3.54,

Subgroup C Non-Diabetic:-

The β-cell percentage ranged from 54.2% to 67.1% with a mean value of 60.5% and S.D. of ± 4.05,

Table (29):-

Percentags of Pancreatic β-cells in Group I offspring at 2, 4 and 12 weeks.

No.	2 Weeks	4 Weeks		12 Weeks	
		Non-Diab.	Diab.	Non-Diab.	Diab.
1	86.4	68.8	46.7	63.5	42.2
2	72.2	64.3	55.4	54.2	48.5
3	64.8	54.5	50.9	58.4	41.1
4	78.5	70.9		67.1	46.7
5	81.1	78.2		55.6	
6	65.6	61.8		59	
7	85	66.1		65.3	
8	79.6	53.7		62.7	
9	86.3	64		59.2	
10	80.2	55.9		61.1	
11	83.7	73.2		66.5	
12	81.4	65.7		58	
13	89.8	62.4		56.3	
14	73.2	57.6		60.1	
15	79.6				
16	65				
17	84.5				
Mean	**78.04**	**64.08**	**51**	**60.5**	**44.63**
S.D	**8.01**	**8.66**	**4.35**	**4.05**	**3.54**

Group II:-

The results of subgroups A, B and C of this experiment were collectively presented in, *Table (30).*

Subgroup A (2 weeks):-

The β-cell percentage ranged from 66% to 95.3% with a mean value of 80.09% and S.D. of ± 8.54,

Subgroup B Diabetic:-

The β-cell percentage ranged from 42.7% to 54.3% with a mean value of 49.3% and S.D. of ± 5.96,

Subgroup B Non-Diabetic:-

The β-cell percentage ranged from 49.6% to 76.6% with a mean value of 61.6% and S.D. of ± 6.99,

Subgroup C Diabetic:-

The β-cell percentage ranged from 39.7% to 52.5% with a mean value of 47.03% and S.D. of ± 6.6,

Subgroup C Non-Diabetic:-

The β-cell percentage ranged from 51.6% to 69.3% with a mean value of 58.9% and S.D. of ± 5.04,

Table (30):-

Percentags of Pancreatic β-cells in Group II offspring at 2, 4 and 12 weeks.

No.	2 Weeks	4 Weeks		12 Weeks	
		Non-Diab.	Diab.	Non-Diab.	Diab.
1	75.6	62.8	42.7	59.2	39.7
2	71.2	54.3	54.3	63.9	52.5
3	78.5	57	50.9	51.6	48.9
4	81.6	66.7		62	
5	90.1	63.2		69.3	
6	80.5	72.9		56.7	
7	66	61.5		51.4	
8	87.8	56.3		58	
9	94.1	49.6		55.8	
10	79.9	64.8		61.5	
11	95.3	62		63.1	
12	72.7	53.1		54.3	
13	89.2	65.4		60.7	
14	67.6	76.6		57.5	
15	83.4	58.9		64.8	
16	74.2	60.5		59	
17	82.5			52.4	
18	77.1				
19	69.4				
20	85.2				
Mean	**80.09**	**61.6**	**49.3**	**58.95**	**47.03**
S.D	**8.54**	**6.99**	**5.96**	**5.04**	**6.60**

Group III:-

The results of subgroups A, B and C of this experiment were collectively presented in, *Table (31).*

Subgroup A (2 weeks):-

The β-cell percentage ranged from 57.3% to 70.6% with a mean value of 64.16% and S.D. of ± 4.24,

Subgroup B (4 weeks):-

The β-cell percentage ranged from 63.3% to 78.4% with a mean value of 71.2% and S.D. of ± 4.22,

Subgroup C (12 weeks):-

The β-cell percentage ranged from 66.5% to 87.2% with a mean value of 77.3% and S.D. of ± 4.87,

Table (31):-

Percentags of Pancreatic β-cells in Group III offspring at 2, 4 and 12 weeks.

No.	2 Weeks	4 Weeks	12 Weeks
			72.8
1	69.2	72.5	84.3
2	65.7	79.2	79.6
3	59.4	77.1	66.5
4	57.5	64.7	78
5	62	74.3	81.1
6	66.8	71.5	80.6
7	58.2	67.2	72.4
8	70.4	69	75
9	67.7	77.3	76.7
10	61.1	66.6	79.9
11	57.3	73.8	75.2
12	66.6	75.4	78.5
13	64	74.2	83.7
14	67.2	72.7	80.3
15	68.1	73.6	68.6
16	59.7	63.3	87.2
17	63	65.2	79.2
18	67.1	68.3	71
19	69.4	71	79.4
20	60.8	66.1	77.1
21	65.2	70.3	76
22	58.5	78.4	78.5
23	62.3	74	73.9
24	66.1	73.2	
25	70.6		
Mean	**64.16**	**71.20**	**77.31**
S.D	**4.24**	**4.22**	**4.87**

The statistical analysis of β-cell percentage in control and experimental subgroups revealed that β-cell percentage increased significantly in groups I and II offspring at the age of 2 weeks. In contrast, a significant decrease in its percentage was noticed in 4 and 12 weeks - aged offspring of the same groups ($P < 0.01$) as shown in ***Table (32).***

Group III showed non-significant difference from the conesponding ages of controls ***Table (32).***

Table (32):-

Mean β-cell percentages ±SD in different aged offspring of control and experimental groups.

Group and number of animals	2 Weeks		4 Weeks		12 Weeks	
	ND	D	ND	D	ND	D
Control no.	62.09±4.49 29		73.57±3.87 29		74.01±4.25 29	
Group I. no. Calculated t	78.04±8.01 17 7.54*		64.08±8.66 14 3.92*	51±4.35 3 8.64*	60.5±4.05 14 10.08*	44.63±3.54 4 15.16*
Group II. no. Calculated t	80.09±8.54 20 8.85*		61.6±6.99 16 6.33*	49.3±5.96 3 6.9*	58.95±5.04 17 10.35*	47.03±6.6 3 6.93
Group III. no. Calculated t	64.16±4.24 25 1.74		71.2±4.22 24 2.11		77.31±4.87 24 2.6	

N.B. **D denotes diabetic and ND denotes non-diabetic.**

*** Denotes significantly different from the corresponding control at ($P < 0.01$).**

B- Determination of the Mean Diameter of β-cell Nuclei.

Control Group:-

The results of subgroups A, B and C of this experiment were collectively presented in, *Table (33).*

Subgroup A (2 weeks):-

The diameter of β-cell nucleus ranged from 3.8μ to 5.9μ with a mean value of 4.88μ and S.D. of ± 0.67,

Subgroup B (4 weeks):-

The diameter of β-cell nucleus ranged from 4μ to (6.6μ with a mean value of 5.38μ and S.D. of ± 0.7,

Subgroup C (12 weeks):-

The diameter of β-cell nucleus ranged from 4μ to 6.6μ with a mean value of 5.5μ and S.D. of ± 0.6,

Table (33):-

The average diameters of β-cell nuclei and their mean values in Control Group offspring at 2, 4 and 12 weeks.

No.	2W	4W	12W
	4.4		
1	4.2	4.5	6.2
2	5.1	5.2	4.5
3	5.8	5	6.3
4	4.2	4.4	4.9
5	5.5	5.9	5.2
6	5.7	4.1	5.8
7	5.3	6.1	6.5
8	5	5.2	4.7
9	5.6	5.9	5.3
10	3.8	5.4	5.6
11	4.5	6.2	4.4
12	5.2	5.2	5.5
13	5.5	4.9	5.7
14	4.4	5.5	4.6
15	4.7	5.3	6.5
16	4.5	6.6	5.6
17	5.8	4.2	6.1
18	4.1	6.1	5.7
19	8.9	5.3	5.4
20	5.2	5.9	6
21	4.2	6.3	6.2
22	5.4	6	5.6
23	4.6	5.3	5.5
24	3.2	5.6	5.9
25	4.5	4	5.4
26	5.2	6.3	6.2
27	5.4	4.9	4.4
28	4.8	5.7	4
29		4.4	5.9
30		6.1	
Mean	**4.89**	**5.38**	**5.50**
S.D	**0.68**	**0.72**	**0.68**

Group I:-

The results of subgroups A, B and C of this experiment were collectively presented in, *Table (34).*

Subgroup A (2 weeks):-

The diameter of β-cell nucleus ranged from 5.2μ to 7.4μ with a mean value of 6μ and S.D. of ± 0.7,

Subgroup B Diabetic:-

The diameter of β-cell nucleus rangedfrom 6.4μ to 8.3μ with a mean value of 7.23μ and S.D. of ± 0.97,

Subgroup B Non-Diabetic:-

The diameter of β-cell nucleus ranged from 5.6μ to 8.2μ with a mean value of 6.56μ and S.D. of ± 0.72,

Subgroup C Diabetic:-

The diameter of β-cell nucleus ranged from 7.2μ to 8.5μ with a mean value of 7.88μ and S.D. of ± 0.55,

Subgroup C Non-Diabetic:-

The diameter of β-cell nucleus ranged from 5.3μ to 7.8μ with a mean value of 6.38μ and S.D. of ± 0.82,

Table (34):-

The average diameters of β-cell nuclei and their mean values in Group I offspring at 2, 4 and 12 weeks.

No.	2 Weeks	4 Weeks		12 Weeks	
		Non-Diab.	Diab.	Non-Diab.	Diab.
1	5.5	5.9	6.4	7.6	8.1
2	7.1	6.3	8.3	6.1	7.2
3	5.9	5.6	7	5.6	7.7
4	5.4	6.2		7.5	8.5
5	5.8	7.5		5.8	
6	5.5	6.1		7.8	
7	6.9	7		6.5	
8	7.4	6.4		5.3	
9	5.2	5.9		6.7	
10	5.5	7.3		5.6	
11	6.2	6.8		5.9	
12	6.3	8.2		5.7	
13	5.2	6.4		6.2	
14	7.1	6.2		7	
15	5.9				
16	5.8				
17	6.3				
Mean	**6.06**	**6.56**	**7.23**	**6.38**	**7.88**
S.D	**0.70**	**0.72**	**0.97**	**0.82**	**0.56**

Group II:-

The results of subgroups A, B and C of this experiment were collectively presented in, *Table (35).*

Subgroup A (2 weeks):-

The diameter of β-cell nucleus ranged from 5.3μ to 6.9μ with a mean value of 5.87μ and S.D. of ± 0.48,

Subgroup B Diabetic:-

The diameter of β-cell nucleus ranged from 6.8μ to 8.2μ with a mean value of 7.47μ and S.D. of ± 0.7,

Subgroup B Non-Diabetic:-

The diameter of β-cell nucleus ranged from 5.7μ to 7.7μ with a mean value of 6.51μ and S.D. of ± 0.57,

Subgroup C Diabetic:-

The diameter of β-cell nucleus ranged from 7.2μ to 8.1μ with a mean value of 7.37μ and S.D. of ± 0.66,

Subgroup C Non-Diabetic:-

The diameter of β-cell nucleus ranged from 5.5μ to 7.7μ with a mean value of 6.5μ and S.D. of ± 0.77,

Table (35):-

The average diameters of β-cell nuclei and their mean values in Group II offspring at 2, 4 and 12 weeks.

No.	2 Weeks	4 Weeks		12 Weeks	
		Non-Diab.	Diab.	Non-Diab.	Diab.
1	6	6.6	7.4	6.1	8.1
2	5.1	6.9	8.2	7	7.2
3	5.6	6.4	6.8	7.4	6.8
4	6.3	7.7		7.2	
5	5.8	5.8		6.2	
6	5.3	7.1		7.4	
7	5.5	6.3		6.7	
8	6.3	5.7		5.8	
9	5.6	6.4		7.3	
10	6.8	6		5.5	
11	5.5	6.5		6.6	
12	5.7	6.4		6	
13	6.1	6.6		5	
14	5.8	7.5		6.3	
15	6.2	6.5		7.7	
16	6.9	5.8		7	
17	5.4				
18	6.2				
19	5.4				
20	5.8				
Mean	**5.87**	**6.51**	**7.47**	**6.58**	**7.37**
S.D	**0.48**	**0.57**	**0.70**	**0.77**	**0.67**

Group III:-

The results of subgroups A, B and C of this experiment werecollectively presented in, *Table (36).*

Subgroup A (2 weeks):-

The diameter of β-cell nucleus ranged from 4μ to 5.8μ with a mean value of 4.76μ and S.D. of ± 0.48,

Subgroup B (4 weeks):-

The diameter of β-cell nucleus ranged from 4.1μ to 6.2μ with a mean value of 5.11μ and S.D. of ± 0.69,

Subgroup C (12 weeks):-

The diameter of β-cell nucleus ranged from 4.6μ to 6.9μ with a mean value of 5.65μ and S.D. of ± 0.68,

Table (36):-

The average diameters of β-cell nuclei and their mean values in Group III offspring at 2, 4 and 12 weeks.

No.	2 Weeks	4 Weeks	12 Weeks
1	5.1	4.8	5.9
2	4.5	6	5.2
3	4.8	4.1	5.8
4	5.2	4.7	4.7
5	4.3	4.2	6.9
6	5.4	4.9	5.6
7	4.1	4.4	5.4
8	5.3	4.6	6.6
9	4.9	4.1	4.9
10	4	5.6	5.4
11	4.9	5.1	6.1
12	4.2	4.6	5.5
13	5.6	6.2	4.6
14	4.5	5.2	6.2
15	5	6	5.3
16	4.7	5.6	6.7
17	4.6	4.5	4.6
18	4.4	5.3	5.3
19	4.1	5.5	6.8
20	5.2	6.1	5.4
21	4.8	4.5	5.7
22	5.8	6	5.9
23	4.4	4.6	6.1
24	4.7	6	4.8
25	4.3		
Mean	**4.76**	**5.11**	**5.64**
S.D	**0.49**	**0.69**	**0.69**

The statistical analysis revealed a significant increase in β-cell diameters of all age subgroups of experimental groups I and II when compared to their age-conesponding controls ($P < 0.01$) as shown in ***Table (37).***

Table (37):-

Mean β-cell nuclear diameter (in μm) ±SD in different aged offspring of control and experimental groups.

Group and number of animals	2 Weeks		4 Weeks		12 Weeks	
	ND	D	ND	D	ND	D
Control no.	4.89±0.68 29		5.38±0.72 30		5.5±0.68 29	
Group I. no. Calculated t	6.06±0.7 17 5.55*		6.56±0.72 14 5.03*	7.23±0.97 3 3.21*	6.38±0.825 14 3.46*	7.88±0.56 4 7.77*
Group II. no. Calculated t	5.87±0.48 20 5.92*		6.51±0.57 16 5.8*	7.47±0.7 3 4.89*	6.58±0.77 16 4.65*	7.37±0.67 3 4.61
Group III. no. Calculated t	4.75±0.49 25 0.84		5.11±0.69 24 1.42		5.64±0.69 24 0.73	

N.B. D denotes diabetic and ND denotes non-diabetic.

* Denotes significantly different from the corresponding control at ($P < 0.01$).