Parents' Awareness Regarding Newborn Screening in Bahariya Oasis City

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Abstract

Back ground: Newborn screening is a public health prevention system that provides early identification for conditions that can affect a child's long-term health or survival. **The aim of** this study was to assess parents' awareness regarding newborn screening in Bahariya Oasis. **Research design:** A descriptive design was utilized. **Setting:** This study was conducted at maternal and child health center in Elbawiti city, Bahariya Oasis in Giza governorate **Sample:** A convenient sample composed of (238) parents accompanied with their newborn. **Tools:** Two tools were used **first tool:** Structured interviewing questionnaire for parents was used, including four parts :**part (I)** Socio-demographic characteristics about parents. **Part(II)** past history reported by parents, **Part (III)** The parent's knowledge regarding newborn screening. **Part (IV)**The parents' reported practices regarding newborn screening. **Second tool:** Attitude scale to assess parents' attitude toward newborn screening. **Results:** The majority of the studied parents had un satisfactory level of knowledge. The majority of the studied parents had a healthy reported practice. The most of the studied parents had positive attitude. **Conclusion:** The study concluded that there were a highly statistical significant relation between total knowledge of parents and their age and educational level. A highly statistical significant relation between total reported practice of parents and their age and educational level. A highly statistical difference relationship between parents' total knowledge and their total reported practices. **Recommendations:** Increasing awareness of parents about newborn screening through mass media and social networks. Further studies including larger samples of parents from different geographical areas to generalize the results in Egypt.

Keywords: Awareness, newborn screening

Introduction:

Newborn screening (NBS) is a successful public health prevention system that has evolved over the sixty years, it provides early identification for conditions that can affect a child's long-term health or survival and treatment of newborns with disorders prior to permanent disability or death **(Powell,2019)** and **(CDC,2021).**

The goal of NBS remains focused on early identification of genetic, endocrine or metabolic conditions in affected newborns and diminishing morbidity and mortality. NBS is generally acknowledged as a system consisting of six-parts that includes education, screening, short term follow-up, diagnosis, treatment with long-term follow-up, and evaluation **(Padilla et al., 2022).**

A successful newborn screening program requires understanding, skilled effort, and collaboration by many individuals from those carrying out the screening test for the baby to family, so it is important for parents to have adequate understanding and awareness about newborn screening **(Groft et al., 2021).**

Community health nurses play a crucial role in the NBS process from obtaining newborn screening after delivery to diagnosis and treatment. Nurses play an important role in the newborn screening program, and their contributions are critical to expanding newborn screening coverage. In a primary care setting or a health facility, nurses are frequently the first point of contact for parents allowing them to advocate for and educate parents about newborn screening record that the parents received information about newborn screening and had an opportunity to ask questions **(WHO, 2022).**

Significance of the Study:

Early detection of hearing impairment or loss facilitates treatment opportunities and helps

children avoid speech problems that can cause psychological illness for newborns. This is in addition to an initiative to detect and treat hearing loss and impairment for newborns, an initiative to eliminate surgical waiting lists and an initiative to support maternal and fetal health**(Zhu et al., 2022).**

In Egypt Congenital hypothyroidism was selected for initiating newborn screening programs because of its high prevalence, availability of screening methods, and cost -effective intervention. Congenital hypothyroidism (CH) is the most common cause of preventable mental retardation and occurs in 1 in 2000 – 4000 newborns. It can be either permanent or transient Moreover Iodine deficiency is a global health problem. The UNICEF categorized Egypt as one of the countries with low iodinated salt consumption with large number of neonates exposed to iodine deficiency **(El Shorbagy et al., 2018).**

Hearing loss is considered one of the most prevalent global health concerns. In Egypt 4.5 million people (approximately five percent of the population) are living with partial or complete hearing loss. Hearing loss among children is estimated to be 20.9% auditory screening has been conducted for one million and 151, 284 newborn children nationwide this comes as part of President Abdel Fattah al-Sisi's initiative, which was launched in September 2019 for early detection and treatment of hearing loss and impairment **(Egyptian Ministry of Health 2020).**

Aim of the Study:

This study aimed to assess parents' awareness regarding newborn screening in Bahariya Oasis through:

1. Assessing parents' knowledge regarding newborn screening.
2. Assessing parents' reported practices regarding newborn screening.
3. Assessing parents' attitude regarding newborn screening.

Research Question:

1. Is there a relation between parents' socio-demographic characteristics and their knowledge regarding newborn screening?

2. Is there a relation between parents' socio-demographic characteristics and their reported practice regarding newborn screening?
3. Is there a relation between parents' knowledge and their reported practices regarding newborn screening?
4. Is there a relation between parents reported practice and their attitude regarding newborn screening?

Research design:

Descriptive study was used to assess parents' awareness about newborn screening.

Setting:

This study was conducted in maternal and child health center in Elbawiti city, Bahariya Oasis in Giza governorate. This setting was selected specially because there was a high flow rate, it serves all citizens whom living in Elbawiti Village, and it considered the biggest center that serves approximately 15 thousand citizen.

Sampling:

Subject:

Convenient sample of (238) parents accompanied with their newborn attending to maternal and child health center from (the total attendance rate was 2000 parents at 2021) according to statistical analysis.

Sample size calculation:

Nearly 238 with confidence level 90% 237, 18

$$n = \frac{N \times p(1-p)}{\left[\left[N-1\times\left(d^2 \div z^2\right)\right]+p(1-p)\right]}$$

n=sample size
z: The standard score
d: The error rate
p: Property availability and neutral ratio
N=size of population **(Thompson, 1996)**

The following two tools were used for data collection:

First tool: An interviewing questionnaire composed of four parts.

Developed by the investigator after reviewing the modern scientific reference related to the subject of the study and the opinion of the experts written in Arabic language and included the following part:

Part (I): Socio-demographic data for parents composed of ten closed ended questions (Q1-Q10) as: age, gender, education level, job, number of children, residence, income, and their children: as age, gender, and child ranking

Part II: The past history reported by parents consisted of 12 closed ended questions (Q11-Q19) Parents' family medical history as : kind ship relation between parent's, family history of genetic disease, health problem of previous children, (c) the child's current medical history as: current health problem.

-**Part III : The parent's knowledge regarding newborn screening** It was composed of 13 closed ended questions (Q20- Q32) as : meaning, important, types, setting,, health workers for conduct, risk for not conduct of newborn screening, meaning, route, suitable time of hearing screening and meaning, route and time of thyroid screening.

❖ **Scoring system:**

Total knowledge questions consisted of (12) questions . The correct answer scored (1degree).The in correct answer scored (zero).The total questions grade was (12 degree).The total score of the knowledge assessment for every parent's was summed-up and converted into a percent score ≥50% (6 – 12 degree) considered satisfactory and <50% (< 6 degree) considered unsatisfactory, the question related to source of information was excluded from the scoring system

Part IV :The Parents 'reported practices regarding newborn screening developed by investigator it was composed of 10 closed ended questions (Q33- Q40) closed ended questions as :

newborn screening done for previous children, the baby was taken by his parent's to go for a timely checkup, requesting the results of the examinations that were done, going in time for re-examination appointment, in case forgetting the examination date, the result of newborn examination, in case of positive results following required referral, in case of positive results following the instructions and treatment plan with doctor in regular basis, guiding the rest of the family on the important of early neonatal screening, guiding neighbors on the importance of early neonatal screening

❖ **Scoring system:**

Regarding scoring system of parent's reported practices it was included 10 questions the maximum possible total score was 20 degree, when reported practice done score 2 when reported practice not done score 1total score of reported practices were summed up and converted into percent score, categorized as the following healthy practices if it were ≥ 60% (10- 20 degree) and unhealthy practices if it were less than 60% (<10 degree)

Second tool: Attitude scale to assess parents attitude regarding newborn screening. (Likert scale) adopted from (**Quinlan and Suriadi, 2006**)

❖ **Scoring system:**

Attitude regarding newborn screening it was composed of 10 statements Include clear statement of positive and negative attitude of parents the scale includes 3 scale score ranging from agree = 3 nutrient = 2 disagree = 1 the maximum possible total score was 30 degree total were summed up and converted into percent score <60% (<15) was negative attitude and score ≥ 60% (≥ 15) degree is considered positive attitude the score was reversed for negative statements

Preparatory phase:

A review of the current, recent, national and international related literatures covering all aspects of the research subjects using the available text books, journals, nursing magazines and

websites were used to get a clear picture of the research problem.

Content validity: the previous tools were tested by five professors from family and community health nursing department–faculty of nursing –Ain Shams University

Content reliability: the previous tools were tested by Cronbach alpha test of reliability, the tools proved to be strongly reliable tools.

Items	Cronbach' alpha test
Knowledge	.699
Practice	0.769
Attitude	0.679

Administrative Design:

To carry out the study in the selected setting, official letters were issued from Dean of the faculty of nursing, Ain Shams University explaining the title and the aim of the study to obtain the permission for collecting of the data; this letters were submitted to the MCH center director

Ethical Considerations:

The study took approval scientific research from ethical committee at the faculty of nursing Ain shams university to carry out the study. Official permission including the title and purpose of the study was submitted from the dean and forward to the director to get approval for data collection. Written consent was taken from parents who agreed to participate in the research process after explanation the aim of study. They were assured that anonymity and confidentiality would be guaranteed and they have the right to withdraw from the study at any time without giving any reason. Ethics, values, culture and beliefs would be respected and when it is possible the study subjects would be provided with feedback about research outcomes.

Pilot study:

A pilot study was applied on (10%) of sample size represented 24 parents to test the feasibility, objectivity, applicability, as well as estimating the time needed to fill the questions.

Caring out the pilot study gave the investigator experience to deal with the included subjects, and the data collection tools. Data obtained from the pilot study was analyzed and no modifications were done. Study subjects included in the pilot were included in the main study sample as no modification were needed.

Field Work

-An approval was obtained from the director of the Bahariya Oasis Maternal child health centers the investigator first met with the parents at the previously mentioned sitting in waiting area and explained the purpose of the study after introducing himself. After the investigator explained the aim of the study to parent's he started the interviewing process by filling the interview questionnaire. The investigator reviewed each point in front of the parents to be sure no points are missed.

- The study sample was collected in the period from the beginning of May 2022 till the end of November 2022 (6 months). The investigator visited the MCH center at the morning shift from 9, 00 am to1, 00 pm for two days per week (Thursday &Saturday). (5-7) parents per day the time needed for completing interview questionnaire was formed 30 minutes for educated parents and 45 minutes for illiterate parents. The parent's assured that the information collected would be treated confidentially and that it would be used only for the purpose of the study (verbal consent was taken from the parent's).

Statistical analysis

• The collected data has been scored, tabulated, and analyzed by personal computer using Statistical Package for the Social Sciences (SPSS) program version 22. Descriptive as well as inferential statistics has been utilized to analyze data pertinent to the study. Level of significant will be set at $P \leq 0.05$.

• The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for Social Science (SPSS) version 22. Data were presented using descriptive statistics

in the form of frequencies and percentage for categorical data, the arithmetic mean (X) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (X) 2, P-value to test association between two variables.

Degrees of significance of results were considered as follows:

- P-value > 0.05 Not significant (NS)
- P-value ≤ 0.05 Significant (S)
- P-value ≤ 0.01 Highly Significant.

Results:

Table (1): shows that, 45.4 % of the studied parent's age was between (30<40) years with the mean age & SD = 31.43 +_ 6.429 years, 55.5 % of them were male. Moreover, 52.9 % of them were secondary education. In addition, 70.2% and 67.2% respectively of them were working and had sufficient income, 67.6 % of them had 1-2 children. While 50.8 % of them were lived in urban areas.

Table (2): demonstrates that, 58 % of newborn's age was < week. Also, 53.40% of them were male. Regarding child ranking between siblings, 36.60% of them were the first child.

Table (3): demonstrates that 53.4% of the studied parents had second degree of consanguinity, 78.6% of them didn't have any genetic diseases in the family. While regarding health problems of the previous children 32.30% of them had congenital defects.

Figures (1): illustrates that 86% of the studied parents had unsatisfactory level of total knowledge. While, 14% of them had satisfactory level of total knowledge related to newborn screening

Figure (2): describes that, 40.8% of the studied parents had information related to newborn screening from doctor or nurse. 36.6% of them had information from friends or relatives. While, 17.2% and 5.5% of them respectively had information from internet or television, and books.

Figure (3): reveals that, 80.7% of the parents reported a healthy practices related to newborn screening compared with 19.3% reported un healthy practice.

Figure (4) : illustrates that regarding total attitude score level 96.2% of the studied parents have positive attitude. While only 3.8% of them were have a negative attitude regarding newborn screening.

Table (4) : reflects that, there were a statistical significant relation between total knowledge of parents and their age (p value.o46) also between total knowledge of parents and number of children (p value.021) while there were a highly statistical significant relation between total knowledge of parents and their educational level (p value.000)

Table (5) : reveals that,there was a statistical significant relation between total score of parent's reported practice and their age (p value.004) however there was highly statically significant relation between total score level of parent's reported practices and their Educational level (p value.000).

Table (6): explains that, there was a highly statistical significance between total knowledge of parents and their reported practice (P value.000).

Table (7): illustrates that, there was no statistical relation between total score of parents reported practices and their attitude (p value 0.213).

Table (1): Number and percentage distribution of parents regarding their Scio-demographic characteristics (N=238).

Demographic characteristics	N	%
Age/years		
<20	6	02.50
20<30	92	38.70
30<40	108	45.40
≥40	32	13.40
Mean and SD	31.43±6.429	
gender		
Male	132	55.50
Female	106	44.50
Educational level		
Not read or write	21	08.80
Reads and writes	27	11.30
Basic Education	30	12.60
Secondary Education	126	52.90
Higher Education	34	14.30
Occupation		
Work	167	70.20
Not work	71	29.80
Number of children		
1-2	161	67.60
3-4	57	23.90
more than 4	20	08.40
Residence		
Rural	117	49.20
Urban	121	50.80
Income		
Sufficient	160	67.20
Insufficient	78	32.80

Table (2): Number and percentage distribution of newborn regarding their demographic characteristics (N=238).

Demographic characteristics	N	%
Age		
< one week	138	58.0
One week - 2 weeks	55	23.10
from 3-4 weeks	45	18.90
Gender		
Male	127	53.40
Female	111	46.60
Child ranking		
First	87	36.60
Second	78	32.80
Third	43	18.10
Fourth and more	30	12.60

Table (3): Number and percentage distribution of parents regarding their family medical history (N=238).

Parents' family medical history	N	%
kinship relation between the parents		
First degree of consanguinity (cousins)	64	26.90
Second degree of consanguinity (children of the father or mother's brother's children)	127	53.40
None	47	19.70
Family history of genetic diseases		
hereditary hypothyroidism	5	02.10
hereditary hearing loss diseases	2	0.80
sickle cell disease (anemia)	42	17.60
Metabolic diseases	2	0.80
None	187	78.60
Health problems in the previous children		
Yes	62	26.10
No	176	73.90
In case of yes (n= 62)		
Thyroid disorder	9	14.50
Hearing loss	16	25.80
congenital defect	20	32.30
genetic disease	17	27.40
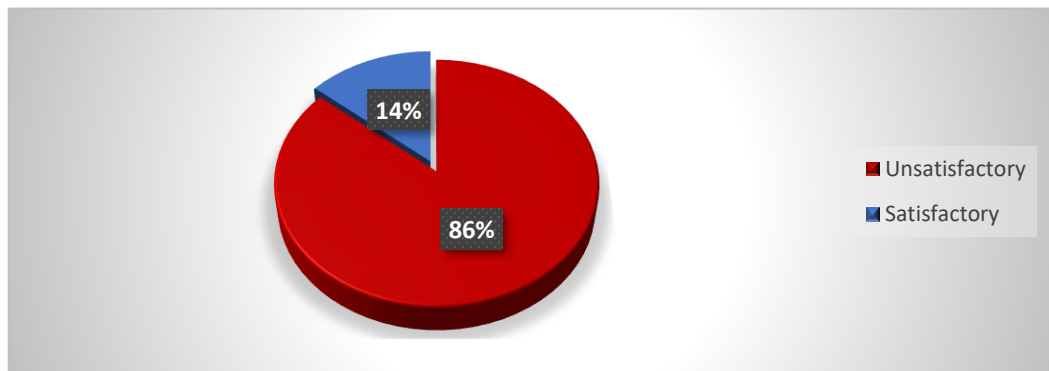
Figure (1): Percentage of total Parent's Knowledge score level regarding newborn screening (N=238).
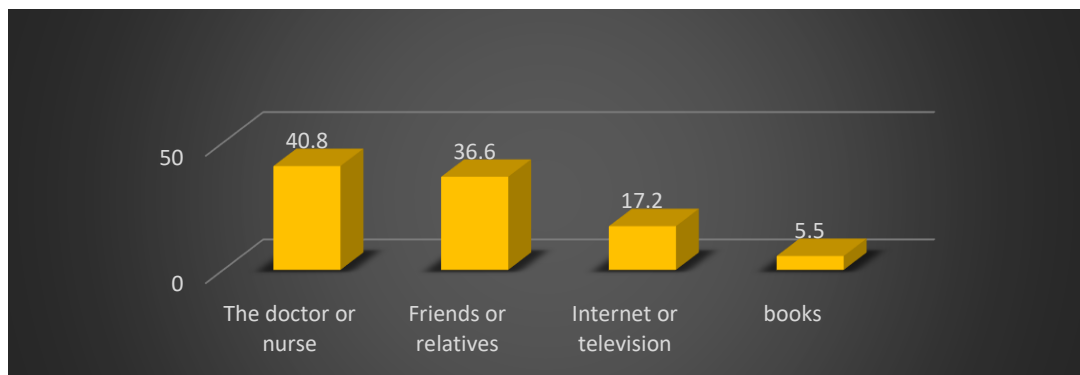
Figure (2): Number and percentage distribution of Parents according to their source of information (N=238).
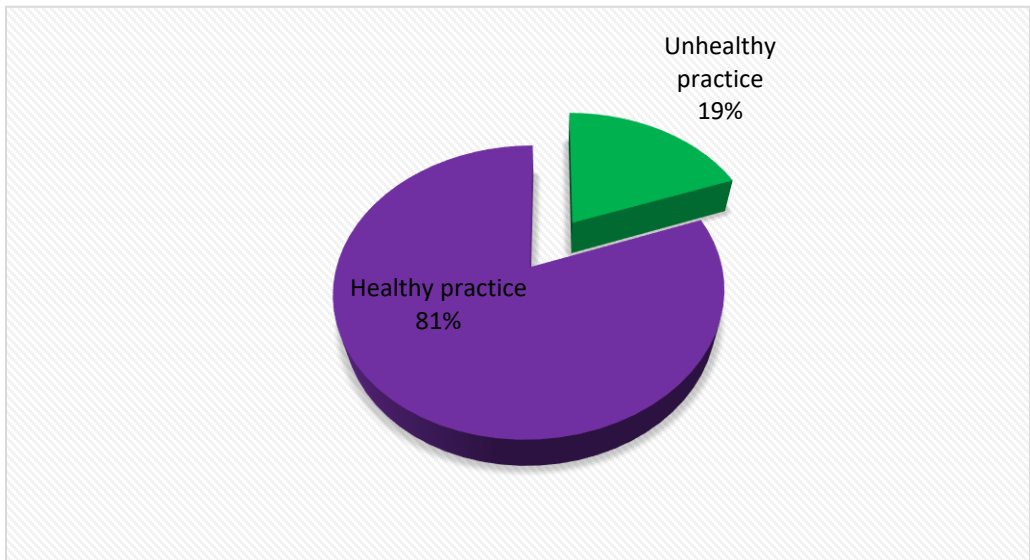
Figure (3): Number and percentage distribution of parents according to their total reported practice score level regarding newborn screening (N=238).
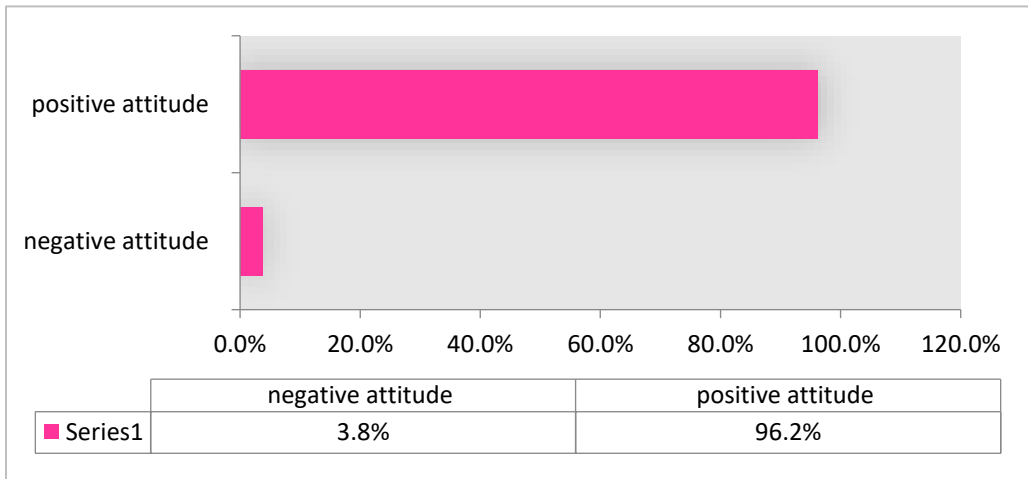

Figure (4): Number and percentage distribution of parents' total attitude score level (N=238).

Table (4): Relation between Socio- demographic characteristics of parents and their knowledge regarding newborn screening (N=238).

Demographic characteristics of Parents	Unsatisfactory Knowledge		Satisfactory Knowledge		χ^2	P value	Sig
	N	%	N	%			
Age/years							
<20	6	2.50	0	0	MC	0.046	S
20<30	84	35.30	8	3.40			
30<40	86	36.10	22	9.20			
>40	29	12.20	3	1.30			
Parental' gender							
Male	115	48.30	17	7.10	0.242	0.092	NS
Female	90	37.80	16	6.70			
Educational level							
Not read or write	21	8.80	0	0	MC	0.000	HS **
Reads and writes	27	11.30	0	0			
Basic Education	30	12.60	0	0			
Intermediate Education	118	49.60	8	3.40			
Higher Education	9	3.80	25	10.50			
Occupation							
Work	148	62.20	19	80	2.902	0.088	NS
Not work	57	23.90	14	5.90			
Number of children							
1-2	132	55.50	29	12.20	MC	0.021	S *
3-4	55	23.10	2	0.80			
more than 4	18	7.60	2	0.80			
Residence							
Rural	101	42.40	16	6.70	0.007	0.933	NS
Urban	104	43.70	17	7.10			
Income							
Sufficient	133	55.90	27	11.30	3.702	0.054	NS
Insufficient	72	30.30	6	2.50			

MC: Monte Carlo test: 2 cells have expected cell count <5
NS=not statistically significant *significant at p<0.05 **highly significant at p<0.01.

Table (5): Relation between Socio- demographic characteristics of parents and their reported practice about newborn screening (N=238).

Demographic characteristics of Parents	Unhealthy practice N	Unhealthy practice %	Healthy practice N	Healthy practice %	χ^2	P value	Sig
Age							
<20	0	0	6	2.50	MC	0.004	S *
20<30	10	4.20	82	34.50			
30<40	33	13.90	75	31.50			
≥40	3	1.30	29	12.20			
Parental' gender							
Male	28	11.80	104	43.70	0.675	0.411	NS
Female	18	7.60	88	37			
Educational level							
Not read or write	2	0.80	19	8	MC	0.000	HS**
Reads and writes	1	0.40	26	10.90			
Basic Education	2	0.80	28	11.80			
Intermediate Education	15	6.30	111	46.60			
Higher Education	26	10.90	8	3.40			
Occupation							
Work	30	12.60	137	57.60	0.668	0.414	NS
Not work	16	6.70	55	23.10			
Number of children							
1-2	36	15.10	125	52.50	MC	0.060	NS
3-4	5	2.10	52	21.80			
more than 4	5	2.10	15	6.30			
Residence							
Rural	21	8.80	96	40.30	0.281	0.596	NS
Urban	25	10.50	96	40.30			
Income							
Sufficient	35	14.70	125	52.50	2.032	0.154	NS
Insufficient	11	4.60	67	28.20			

MC: Monte Carlo test: 2 cells have expected cell count <5
NS=not statistically significant *significant at p<0.05 **highly significant at p<0.01

Table (6): Relation between parents, total knowledge and their reported practice regarding newborn screening (N=238).

Reported practice of Parents	Total Knowledge Incorrect N	Total Knowledge Incorrect %	Total Knowledge Correct N	Total Knowledge Correct %	χ^2	P value	Sig
Unhealthy	21	8.80	25	10.50	78.24	0.000	HS
Healthy	184	77.30	8	3.40			

NS=not statistically significant *significant at p<0.05 **highly significant at p<0.01

Table (7): Relation between total score of parents, reported practice and their attitude regarding newborn screening (N=238.)

Attitude	Reported practice of Parents Unhealthy N	Reported practice of Parents Unhealthy %	Reported practice of Parents Healthy N	Reported practice of Parents Healthy %	χ^2	P value	Sig
Negative	0	0	9	3.80	MC	0.213	NS
Positive	46	19.3	183	76.90			

NS=not statistically significant *significant at p<0.05 **highly significant at p<0.01

Discussion:

This study aimed to assess parents' awareness regarding about newborn screening in Bahariya Oasis

Part: demographic characteristics of parents and their newborn

Concerning parents' socio-demographic characteristics the results of the current study revealed that, less than half were aged 30 -> 40 with mean age 31.43 ± 6.429, more than half were male, more than half were secondary education, while more than two thirds have an occupation, also more than two thirds have sufficient income, more than two thirds have from 1 to 2 children, and more than half of them were living in urban area **(Table 1).** These results in agreement with the study conducted by **Kariyawasam et al., (2020)** on the implementation of newborn screening for spinal muscular atrophy: the Australian experience in Australia and found that, 60% of the studied sample were male and 70% of them were living in urban areas. Concerning newborns' socio-demographic characteristics the results of the current study illustrated that, more than half aged less than one week, also more than half were male and more than one third were the first child regarding their ranking between siblings **(Table 2)**.

Part II: parents' past medical history

with the study conducted by **Wang et al., (2019)** on nationwide population genetic screening improves outcomes of newborn screening for hearing loss in China and found that, 86.9% of the studied sample have no family history of genetic diseases and 3.8% of them have family history for hearing loss. **Rationale:** this agreement may be due to that, the effectiveness of premarital counseling program that considered an obligatory issue from the state and gene type of high-risk group

Part III: parent's total knowledge about newborn screening

Regarding parent's total knowledge about newborn screening, the current study showed that, the majority of parents had un

Concerning the family medical history of parents, the present study demonstrated that, slightly more than one quarter were have first degree of consanguinity while more than half were have second degree of consanguinity **(Table3)**. These results contraindicated with the results of the study conducted by **Dababneh et al., (2022)** on epidemiology of Phenylketonuria disease in Jordan and found that, 74.2% of the study sample have first degree of consanguinity and 09.90% have second degree of consanguinity. These results in the same line with the study conducted by **Leal et al., (2023)** on parental consanguinity and risk for childhood hearing loss in Portugal and found that, 24% of the studied sample have first degree of consanguinity.

Rationale: the difference may due to culture, traditions, and attitude differences between countries and individuals.

Regarding family history of genetic diseases, the results of the current study showed that, more than three quarter have no family history and the minority have family history for heredity hearing loss disease **(Table 3).** These results agreed with the study conducted by **Sadek et al., (2018)** on clinical and neuropsychological outcomes for children with phenylketonuria in Upper Egypt and found that 58% of the studied sample have negative family history. These results also in the same direction.

satisfactory level of knowledge **(Figure1)**. This result matched with the result of the study conducted by **Fitzgerald, et al., (2017)** under the title of an evaluation of pregnant women's knowledge and attitudes about newborn bloodspot screening in Ireland and found that, 87% of the studied sample reported that they would like more information about newborn screening. This result also in the same direction with the results of the study conducted by **Friedman et al., (2017)** on genomic newborn screening: public health policy considerations and recommendations in Canada and stated that there was a poor understanding of newborn screening among parents. This result as well contraindicated with the study conducted by **Fitzpatrick et al., (2019)** on the parental awareness of newborn bloodspot

screening in Ireland and found that, 63.51% of the studied parents reported awareness about newborn screening. This result in disagreement with the study carried out by **Coupal et al., (2020)** on newborn screening knowledge and attitudes among midwives and out-of-hospital-birth parents in the USA and found that, 62% of the studied parents had a satisfactory knowledge about newborn screening. This result in disagreement with the study carried out by **Ong et al., (2022)** on the knowledge, attitudes, and awareness towards newborn screening in association with received prenatal care: a survey of primiparous postpartum mothers at the Philippine general hospital and found that, 71.30% of the studied sample aware about newborn screening.

Rationale: these results may be related to the difference of educational level of the studied sample of every study. The studied sample of the present study referred to their limited knowledge to insufficient information provided by health care providers or mass media although more than two thirds of them were secondary and high education and could seek to get knowledge by themselves.

As regard parents' source of information about newborn screening, the results of the present study displayed that, more than two fifths informed that "the doctor or the nurse" while more than one third informed that " friends or relatives" in addition to less than one fifth informed that "internet or television" and less than one tenth informed that "books" **(Figure2).** These results in contrast with the study conducted by **Temme et al., (2015)** on assessment of parental understanding of positive newborn screening results and carrier status for cystic fibrosis with the use of a short educational video in the USA and found that, about the source of information 7 %, 6%, and 54% of the studied sample respectively from medical professional, family and friends, and internet. These results in disagreement with the study carried out by **Franková et al., (2019)** on the factors influencing parental awareness about newborn screening in Czech Republic and found that concerning the source of information about newborn screening 82% of the studied sample their source was the doctor or nurse, 22% of them their source was the internet and

17% of them was other sources. These results in disagreement with the study conducted by **Qirjazi et al., (2020)** on the mothers' perceptions of universal newborn hearing screening in transitional Albania and found that, 67.30% their source of information from the doctor, while 08.60% from friends and relatives, and 05,60% from internet and television. These results contraindicated with the study conducted by **Graham, (2020)** on the development of an assessment tool that measures change of knowledge, attitude and practice of mothers towards universal newborn hearing screening programme in South Africa and found that, 97% from clinics, 5% from family and friends, 35% from radio, and 10% from newspaper concerning source of information about newborn screening. These results also contraindicated with **Topuz et al., (2021)** on the views of mothers about national newborn screening tests performed in Turkey and found that 81.10% of the studied samples' source of information from health personnel. These results agreed with the study conducted by **Ong et al., (2022)** on the knowledge, attitudes, and awareness towards newborn screening in association with received prenatal care: a survey of primiparous postpartum mothers at the Philippine general hospital and found that45.60% of the studied sample informed "physician" and 04.40% of them informed "internet" regarding source of information about newborn screening. **Rationale:** this difference may be due to variation of health culture between individuals and as well difference of their source of information.

Part IV: parents' total score of reported practices

The results of the present study showed that, less than one fifth of the studied parents had un healthy practices regarding new born screening **(Figure3).** This result matched with the result of the study carried out by **Elsayed et al., (2020)** on the assessment of mothers care toward their children having phenylketonuria in Egypt and found that 14.90% of the studied sample had poor practices. This result also in the same direction with the study conducted by **Ez Eldeen et al., (2022)** on the mothers' knowledge and practice regarding care of their children with congenital hypothyroidism in

Egypt and found that and found that, 66% of the study sample had adequate practice. **Rationale:** this similarity may be due to mothers were keen on the health of their children so they were committed to attend on the time of newborn screening test and to follow the instructions of health care providers if there were any problems.

Part V: Total attitude score of parents about newborn screening

Regarding total attitude score of parents about newborn screening, the current study revealed that, the most of them had appositive attitude toward newborn screening **(Figure4)**. This result supported by the result of the study conducted by **Al-Sulaiman et al., (2015)** under the title of assessment of the knowledge and attitudes of Saudi mothers towards newborn screening in KSA and found that, 91% of the studied sample had appositive attitude toward newborn screening. This result also agreed with the study conducted by **Gies et al., (2016)** on attitudes of parents of Klinefelter boys and pediatricians towards neonatal screening and fertility preservation techniques in Klinefelter syndrome in Belgium and found that, 83.80% of the study sample had a positive attitude toward newborn screening. This result in accordance with the study conducted by **Elbeltagy et al., (2019)** on the hearing loss-related knowledge and attitude toward neonatal hearing screening among Egyptian parents in Egypt and found that, 99.50% of the studied parents had a good attitude toward newborn screening. This result as well agreed with the study carried out by **Wang et al., (2022)** on the Pregnant Latinas' views of adopting exome sequencing into newborn screening in the UAS and stated that, pregnant Latinas had favorable attitudes toward newborn screening.

This result disagreed with the study conducted by **Abdel Malek et al., (2022)** on the effectiveness of a screening toolkit on empowering mothers about neonatal screening tests for metabolic disorders and hearing defects in Egypt and found that, 57.20% of the study sample had a negative total attitude about newborn screening.

From the investigator's point of view: the agreement of the results may be related to the satisfactory level of reported practices of parents.

Part VI: statistical relation between study variables

Concerning the statistical relation between socio-demographic characteristics of the studied sample and their knowledge about newborn screening, the results of the present study illustrated that, there was a statistical relationship between the age of the studied parents and their knowledge (p.value =0.046) **(Table 4)**. This result agreed with the study conducted by **Alsudays et al., (2020)** on parental knowledge and attitudes to childhood hearing loss and hearing services in Qassim, Saudi Arabia and found that, a significant association between age of the studied sample and knowledge (p. value = 0.002).The results of the current study showed that there was a highly statistical relation between educational level of parents and their knowledge related to newborn screening (p.value =0.000) **(Table 4).** This result in accordance with the study carried out by **Nnodu et al., (2018)** on the a multi-centre survey of acceptability of newborn screening for sickle cell disease in Nigeria and found that, statistical significance relationship between knowledge of the studied sample and educational status (p.value = 000). This result contraindicated with the study carried out by **Jatto et al., (2018)** on the mothers' perspectives of newborn hearing screening programme in Ghana and stated that, the educational level of the studied sample had no association with awareness (p value = 0.11). This result alo in the same direction with the study conducted by **Memon et al., (2019)** on knowledge, attitude, and practice among mothers about newborn care in Sindh, Pakistan and found that, the studied mothers with no education had less significant knowledge score about newborn care compared with mothers had higher education level (p.value < 0.05).The results of the present study revealed that, a statistical significance relationship between parents' age and their reported practice about newborn screening (p.value = 0.004) **(Table5).** This result agreed with the study conducted by **Katamea et al., (2022)** on the factors associated with

acceptability of newborn screening for sickle cell disease in Lubumbashi city, Democratic Republic of the Congo and found that, a statistical significance relationship between parents' age and their practice (p.value =0.002).

From the investigator's point of view: the age and educational level are important factors that can affect the knowledge and practice as older parents have more experience and educated parents have the ability to discuss and ask to get information from the right source.

The results of the current study displayed that, there was a highly statistical difference relationship between total knowledge of parents and reported practices related to newborn screening (p.value=0.000) **(Table 6).** This result in agreement with the study conducted by **Mohamed El-Naggar et al., (2023)** on knowledge and practices of postpartum women regarding neonatal care in El-Beheira governorate in Egypt and stated that, there was a positive significant correlation between total knowledge score and total practices level (value < 0.000).This result disagreed with the study carried out by **Tutuba et al., (2022)** on the predictors of the effectiveness of health education intervention and infant diagnosis for sickle cell disease among pregnant women attending antenatal clinics in dar-es-salaam, Tanzania: a quasi-experimental study and found that, there was no statistical significance between parents' knowledge and their practice (value = 0.17). **From the investigator's point of view:** the agreement proved the importance of knowledge and its impact in parents practice and the disagreement may related to individual differences in the form of seeking information, experience, tradition and culture. The results of the current study revealed that, there was no statistical relation between total score of parents reported practice and their attitude (value = 0.213) **(Table 7).**this result contraindicated with the study conducted by **Abel Malek et al.,(2022)** as there was a highly statistical significant relation between parents' practice, awareness and total attitude.

Conclusion:

Based on the finding of the research questions and the study findings it is concluded that:

Most of the studied parents had unsatisfactory level of knowledge. Also, most of them had healthy reported practice, Moreover majority of studied parents had positive attitude. There were a highly statistical significant relation between total knowledge of parents and their educational level. Also there were a statistically significant relation between total knowledge of parents and their age, number of children. Moreover there was highly statistical significant relation between total level of parent's reported practices and their educational level. Also there was significant relation between total level of parents' reported practice and their age. There was highly statistically significant relation between total level of parents' knowledge and their reported practices.

Recommendations:

Based on the findings of the present study the researcher recommended that:

1- Increasing awareness of the parents about newborn screening through mass media and social networks.

2-Further study include larger sample to generalize the results in Egypt.

3-Conducting educational and training programs periodically and regularly to improve parent's knowledge and practice related to newborn screening

4- Availability of relevant written and visual information in maternal child health centers to facilitate parent's education about newborn screening such as educational booklets

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