Knowledge of Neonatal Hyperbilirubinemia Among Primary Health Care Physicians: A Single-Center Experience

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ABSTRACT

BACKGROUND AND OBJECTIVES: To evaluate the knowledge of the primary health care physicians (PHCP) in Kalubia governorate, Egypt, about the causes, diagnosis, complications, and treatment of neonatal hyperbilirubinemia (NHB).

METHODS: Cross-sectional survey distributed by interview to 500 physicians working in the primary health care (PHC) sector in Kalubia.

RESULTS: Out of 500 distributed surveys, 419 (84%) PHCP completed the questionnaire. They represent 174 (90%) out of 193 PHC units and centers. About 18% were males and 82% females with mean age of 28.5 ± 5.2 years, and mean duration of work was 3.3 ± 4.4 years. All of the respondents have patients with NHB in their daily practice. The knowledge of the PHCP was good in some aspects about NHB; however, it was poor and may be even hazardous in other aspects.

CONCLUSIONS: Many areas of defects are detected in PHCP knowledge about NHB. Pre-service and continuous training of the PHCP about the diagnosis and management of NHB are essential.

KEYWORDS: Education, medical diagnosis, newborn, newborn screening

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Introduction

Hyperbilirubinemia is a very common problem in neonates specially term and the late preterm infants. Critical hyperbilirubinemia is uncommon but has the potential for causing long-term neurological impairment (kernicterus).[1,2] Bilirubin-induced encephalopathy is a preventable cause of mental retardation, and its prevention is much easier and less costly if diagnosed timely and managed properly.

Although there is no national registry for cases of kernicterus in Egypt, many Egyptian studies reported a lot of patients with bilirubin encephalopathy.[3–5] In one study, kernicterus was the third most common cause of developmental delay in Egyptian children composing 9% of the whole etiologies (105 of 1161).[6] In other 2 studies, neonatal jaundice was a major contributing cause for cerebral palsy in Egyptian children.[7,8]

Egypt, along with other middle- and low-income countries, is recorded to have the majority of cases of severe hyperbilirubinemia and kernicterus all over the world.[9–12] In North America, hyperbilirubinemia continues to be the most common cause of neonatal readmission to hospitals.[13,14]

Based on all these critical findings, we believe that assessment of the knowledge of primary health care physicians (PHCP) is crucial as they have pivotal role in diagnosis and management of neonatal hyperbilirubinemia (NHB). This study was conducted in Kalubia governorate, Egypt, to assess the knowledge of PHCP about NHB.

Subjects and Methods

We conducted a cross-sectional study on physicians working at primary health care (PHC) centers and units, Kalubia governorate, Egypt, during the period from September 2017 through May 2018 to assess their knowledge about NHB. The study was approved by the ethical and research committees of Benha University and the directorates of Health Affairs of Kalubia governorate, Egypt. Written informed consent was obtained from the contributing physicians for their participation in our survey.

Questionnaire development and distribution

A simple structured interviewing questionnaire was developed, with questions chosen to specifically assess the PHC practitioners' demographic data; chance of dealing with patients with NHB; their knowledge about screening, diagnosis, causes,

complications, and management of NHB; and whether they received any special training about that.

The study questionnaire includes the following:

1. Demographic data: age, sex, work years in the PHC level, qualifications (MBBCh, Master's degree, Diploma, others), and place of work (Family Health center, Health office, Rural Health unit);
2. Chance of dealing with patients with NHB in the PHC center;
3. Knowledge about methods of screening and assessment of the severity of NHB: cephalocaudal evaluation, color of urine, color of stool, total serum bilirubin measurement, and transcutaneous bilirubinometry;
4. Knowledge about possible etiologies NHB: ABO incompatibility, RH incompatibility, sepsis, breast feeding, prematurity, and physiological;
5. Knowledge about alarming manifestations for development of complications of NHB: feeding refusal, convulsions, high-pitched cry, fever, arching of the back, and down turning eyes;
6. Knowledge about management of NHB: drugs like silymarin, phenobarbitone, and vitamins; phototherapy; and exchange transfusion;
7. Knowledge about recommended advice to the mother regarding her jaundiced baby: bring baby to the office, put baby in the sunlight, put baby in fluorescent light, stop breast feeding, and maintain breast feeding. Whether they received any special training in neonatal care especially regarding NHB and whether they feel that they need training if not received.

Questionnaire testing

Before starting data collection, the questionnaire was distributed among a group of experts in this field, statisticians, and neonatologists. Test–retest reliability was applied, and the questionnaire proved to be reliable. Pilot study was also conducted and no modifications were done. The questionnaire was considered easy to complete and suitable for PHC level by those who participated in the pilot testing. A total of 500 questionnaires were distributed by interviewing the physicians during the monthly meetings of the PHC of each city. The survey was voluntary and no incentive was given to participants, and informed consent was taken from physicians who accepted to participate in the survey.

Statistical Analysis

The collected data had been tabulated in Microsoft office Excel sheet and analyzed using Statistical Package of Social Science (SPSS) version 16.

Qualitative data were expressed in number and percent. Regression analysis was used to find out the independent predictors of the physcian knowlage. The accepted level of significance in this work was 0.05.

Table 1. Demographic data of the participants.

DEMOGRAPHIC DATA	
Sex	
Male: No. (%)	76 (18.2)
Female: No. (%)	344 (81.8)
Age (mean ± SD, y)	28.5 ± 5.2
Work experience (mean ± SD, y)	3.3 ± 4.4
Educational level	
MBBCh only: No. (%)	366 (87.4)
Master's degree: No. (%)	53 (12.6)
Received neonatal care training	
Yes: No. (%)	60 (14.3)
None: No. (%)	334 (85.7)

Results

This study was carried out at the PHC centers and units of Kalubia governorate, Egypt, to assess the knowledge of the physicians working there about NHB.

A total of 193 PHC centers, in which 612 physicians are working, were included. Questionnaire was distributed to 500 physicians; among them, 419 (84%) working at 174 (90%) PHC centers completed it.

Their demographic data are listed in Table 1, which shows that only 12.6% of them received postgraduate training, master's degree, and only 14.3% received neonatal care training. All of them encountered patients with NHB in their daily practice.

In total, 87% of them knew that total serum bilirubin measurement is the most important method for screening and assessment of the severity of NHB.

Only 33% knew about transcutaneous bilirubinometry. On the other hand, 61% had used cephalocaudal evaluation as method of NHB evaluation (Table 2).

Most of the physicians had the correct knowledge that physiological hyperbilirubinemia is the most known cause followed by ABO and RH incompatibilities. Only small percentage knew about sepsis, G6PD, and prematurity (Table 3).

Regarding alarming signs for complications of NHB, 81% mentioned convulsions. Fourteen percent mentioned high-pitched cry (Table 4).

On assessment of the knowledge about management, nearly 90% of physicians mentioned phototherapy and exchange transfusion. Continuing breast feeding was recommended by 75% of physicians. On the other hand, a considerable percentage of them, up to 44%, used drugs, vitamins, and other medications (Table 5). Regression analysis showed that the physicians' Duration of work, Level of education and receiving Neonatal care training were significant predictors of knowledge score

Table 2. Knowledge about methods of screening and assessment of the severity of neonatal hyperbilirubinemia.

VARIANT	NO. (%)
Cephalocaudal evaluation	256 (61.0)
Total serum bilirubin assessment	365 (87.1)
Transcutaneous bilirubinometry	138 (33.0)
Color of urine	117 (27.9)
Color of stool	77 (18.4)

Table 3. Knowledge about causes of neonatal hyperbilirubinemia.

CAUSES OF NEONATAL HYPERBILIRUBINEMIA	NO. (%)
ABO incompatibility	357 (85.2)
Rh incompatibility	331 (79.0)
Sepsis	201 (48.0)
G6PD	203 (48.4)
Prematurity	313 (74.7)
Physiological	401 (95.7)

Table 4. Knowledge about alarming signs for complications of neonatal hyperbilirubinemia.

SIGN	NO. (%)
Refusal of feeding	233 (55.6)
Convulsions	343 (81.6)
High-pitched cry	62 (14.8)
Fever	141 (33.6)
Arching of the back	42 (10.0)
Muscle tone changes	57 (13.6)

Table 5. Knowledge about lines of management of neonatal hyperbilirubinemia.

MANAGEMENT INTERVENTIONS	NO. (%)
Drugs (like silymarin)	182 (43.4)
Drugs (like phenobarbitone)	55 (13.1)
Vitamins	201 (48.0)
Recommendations to the mothers	
Expose the baby to sunlight	57 (13.6)
Expose the baby to fluorescent light	125 (29.8)
Continue breast feeding	317 (71.6)
Phototherapy and exchange transfusion	379 (90.4)

Table 6. Regression analysis of factors affecting physicians' knowledge of neonatal hyperbilirubinemia in the studied physicians.

	BETA	95% CI FOR BETA*		P VALUE
Age	0.121	−0.067	4.84	>0.05
Sex	0.091	−0.013	4.025	>0.05
Duration of work	0.223	1.25	3.58	<0.001
Level of education	0.368	5.21	7.35	<0.001
Neo-natal care training	0.28	3.21	5.64	<0.001

*Confidence Interval

among the studied physicians (P< 0.001), while physicians' age and sex was non significant predictors for it (Table 6).

Finally, most of the contributing physicians agreed that they need training about neonatal care especially about NHB.

Discussion

Hyperbilirubinemia is a real common problem in neonates with a potential for causing serious sequels if not properly treated that made the basis of this study as we aimed to assess the knowledge of the PHC physicians who are usually the first ones who face and assess these patients and in turn directly affect the outcome of disease.

Most of the newborns visit the PHC units within the first 6 days of life for neonatal thyroid gland function screening (83.3%) and this figure increased to 95% at 14th day of life,[15] or for BCG vaccine which is commonly given within the first week of life. This gives opportunity for early detection and proper management for NHB. So the PHCP are the closest health care providers to the community. They face jaundiced babies in their PHC units before pediatrician so they play an important role in recognition and referral of jaundiced babies at risk of developing complications.

In this study, we chose Kalubia governorate as it is a good representative of different Egyptian governorates by having both rural and urban areas.

As we expected, all of the contributing physicians face patients with NHB in their daily work. Although there is Egyptian board training for family medicine, most of the PHC doctors are general practitioners, freshly graduated, and have no subspecialty or postgraduate training.

Total serum bilirubin measurement was the most commonly known method by them (87.1%) for screening and assessment of the severity of NHB. This was comparable to the results of American and British studies, as the studied pediatricians used it in 87.4% and 87% of their patients with clinical NHB, respectively.[16,17] It is the most common test used in neonatal units.[18]

Blood sampling is painful, relatively expensive, and causes psychic stress for the parents; moreover, the laboratory services

are not available in all PHC units, especially in rural areas but it is the most accurate.

In this respect, it is of concern to mention that De Luca et al[19] were the first to describe bilirubin nomogram from European neonates. De Luca et al[20] further compared bilirubin nomograms from different populations and found some differences across different populations.

Around 61% of PHCP assessed the severity of neonatal jaundice by visual cephalocaudal evaluation inspecting the skin or sclera which is rapid and cost-free, but it is not sufficiently accurate, especially when applied to newborns with dark skin.[21,22] On the other hand, transcutaneous bilirubinometry was known by 33% of them, but it was not used due to its unavailability at the level of PHC facilities. It is only available in most of the general hospitals. Transcutaneous bilirubinometry is fast, noninvasive, and relatively inexpensive and has been shown to correlate well with serum bilirubin levels in term and near-term infants.[23] Petrova et al[16] reported higher utilization (77.9%) of the cephalocaudal progression of jaundice and lower utilization (16.1%) of transcutaneous bilirubinometry in their study on pediatricians. However, Chowdhury et al[17] reported that 34% of pediatricians used visual assessment and only 1% of studied group used the transcutaneous bilirubinometry as a sole method for NHB evaluation.

Questions about etiology revealed an area of good knowledge as most of them choose physiological jaundice, and ABO and RH incompatibilities as the most common causes of NHB. It was of concern that only small percentage of them knew about prematurity, neonatal sepsis, and G6PD as important causes of NHB which they should investigate for.

Gamaleldin et al[3] reported that ABO and Rh incompatibilities and neonatal sepsis are the most common causes of severe hyperbilirubinemia in Egypt and most of middle- and low-income countries.[24]

Bilirubin encephalopathy is the most serious complication of NHB. It refers to the acute manifestations of bilirubin toxicity seen in the first few weeks after birth with initial signs including lethargy, hypotonia, and poor suck progressing to hypertonia, high-pitched cry, and eventually seizures and coma. Our study revealed a great misconception of the participants about the signs of acute bilirubin encephalopathy as most of the respondents chose convulsions which is a terminal sign that means that permanent sequels is highly expected. They greatly missed other early signs which mean that a lot of patients will be missed. Fever was mentioned by 34%, but unfortunately it is not considered a sign of complication (Table 4).

Regarding management, majority of physicians had correctly chosen phototherapy and exchange transfusion with recommendation to continue breast feeding in 75.5% of them. All pediatricians (100%) in the study by Petrova[16] recommended continuation of breast feeding, while 13% of pediatricians and 16% of neonatologists interrupted breast feeding in the study by Gartner et al[25]; on the other hand, 44% of family physicians recommended continuation of breast feeding in the study of Madlon-Kay.[26]

Considerable number of the studied PHCP wrongly recommended using oral silymarin and multivitamins, and minority recommended phenobarbitone.

Although phenobarbitone enhances conjugation and excretion of bilirubin, its use is prohibited as it has sedative effect and long-term hazardous sequlae.[27] No evidence supports the use of silymarin and vitamins.[19]

Around 13.1% of the study physicians recommended to put babies in sunlight compared to only 1.1% of the pediatricians in the study by Petrova,[16] while family physicians in the study by Madlon-Kay[26] reported the highest percentage (28%). Although sunlight provides sufficient irradiance in the 425- to 475-nm band to provide phototherapy, a study has shown filtered sunlight to be a cheap, safe, and efficacious alternative to conventional phototherapy in the treatment of jaundice in African newborns,[28] practical difficulties involved in safely exposing a naked newborn to sunlight, either indoors or outdoors (avoiding sunburn), preclude the use of sunlight as a reliable therapeutic tool, and it is therefore not recommended.[19] Tridente and De Luca[29] compared the efficacy of light-emitting diode versus other types of phototherapy and found no significant difference.

We consider all these practices are dangerous trend as reliance on unproven medications or recommendations in the management of hyperbilirubinemia is very hazardous. From our experience, the false sense of security that these practices create in mothers of affected infants often leads to delayed presentation of such babies in hospital with severe hyperbilirubinemia and acute bilirubin encephalopathy as proved by some Egyptian studies.[3,5] Not only this, but we also noticed that these mothers recommend these practices to their relatives and neighbors as the cases of jaundice apparently improved as majority of the cases are physiological jaundice which improve spontaneously.

Conclusions

Although the knowledge of the PHCP is good in some aspects about NHB, it is poor in other aspects. We also thought that improving this knowledge will help in proper and early management of NHB in Egypt and similar countries and will decrease the frequency of its long-term complications. We recommend application of pre-service and on-the-job training for PHCP about neonatal care especially NHB.

Author Contributions

MAM set the idea of the study and designed the study. MAM, NMK, and LMS reviewed literature, drafted the manuscript, and critically analyzed the data. SE performed data analysis. MAM, EA, HA, and WA performed the survey and collected data. All authors reviewed and approved the manuscript for final publication.

Data Sharing

No additional data available.

Ethical Approval and Informed Consent

Ethical approval and consent forms were fulfilled.

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