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Towards a Uniform Newborn Screening Panel in the Kingdom of Saudi Arabia

Ahmed Bashir[1]*, Karen Weissbecker[2], Asim Abdul-Mageed[3] and Hans Andersson[4]

[1]*Almana General Hospital, Jubail, Saudi Arabia*

[2]*Hayward Genetics Program, Tulane University Medical School, USA*

[3]*Professor of Urology, Director, Molecular Oncology Research, Tulane University Health Science Center, USA*

[4]*Director, Hayward Genetics Center, Karen Gore Professor of Human Genetics, Tulane University Medical School, USA*

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***Corresponding author:** Ahmed Bashir, Almana General Hospital, Jubail P.O Box 10366, 31961, Kingdom of Saudi Arabia, Email: abashir@tulane.edu

Abstract

Newborn screening uses population based screening test panels to identify newborns with medical conditions that could befit from early diagnosis and treatment. It involves a complex set of interlocking components with proper communication channel between the laboratory and the referring doctor. In 2006, the American College of Medical Genetics (ACMG) outlined the minimal criteria for which disease should be tested within 24-48 hours postnatally: A test should be available to diagnose the disease, it should be a demonstrated benefit of the test in terms of treatment availability, it should be cost effective, and the cost itself should be considered. This paper will briefly review the importance of newborn screening, and will discuss it is application in the kingdom of Saudi Arabia

Introduction

What is Newborn Screening?

If you were to conduct a survey of the public, and ask them what Newborn Screening is, most would probably respond with a description of a baby's foot being stuck by a lancet, with the blood being sent "somewhere". Later, their baby's Doctor informs them "everything was fine". On the other hand, they may tell you that they have no clue at all. In fact, newborn screening is an essential part of the public health care by providing early diagnosis of treatable disorders before irreversible damage is done.

Newborn screening involves a complex set of interlocking systems that use population based screening test panels to identify newborns with conditions that may benefit from rapid identification and or treatment. The components of the newborn screening program include: The screening itself, which involves proper handling and safe transportation of the samples from the referring hospital to the designated laboratory, proper documentation of the demographic data from the referring hospital where the newborn was delivered, and proper testing. Ability to perform confirmatory testing and subsequent diagnosis.

The proper communication channel between the laboratory and the referring doctor when there is an abnormal result identified or suspected. Ability to perform confirmatory testing and subsequent diagnosis.

Early involvement of the attending physician for abnormal results, proper management as time factor is important in management outcome and prognosis.

Medical education for health providers, families, parents, and patients, to ensure appropriate genetic counseling and follow –up treatment and management of the disorder.

Laboratory quality assurance through continuous periodic inspection, laboratory standards evaluation and quality assurance is essential tools to run the newborn screening program without missing any positive cases [1].

In addition to these criteria mentioned above, the incidence of a given disorder must also be considered in establishing screening programs in a given state or country.

Classical Presentation of Undiagnosed Patients

One of the core principles of newborn screening is the ability to diagnose patients early to provide proper treatment. It is therefore important to understand the clinical presentation of patients who go undiagnosed.

An undiagnosed patient with early onset disease may present with normal delivery, normal Apgar scores and are often admitted to normal newborn nurseries. However, this same newborn will suddenly get sick with lethargy, vomiting, seizures and blood gas

analysis will reveal severe metabolic acidosis and or hypoglycemia. The clinical picture will quickly change from a normal baby to one with multiple severe problems [2].

Other newborns with neonatal onset present with low Apgar score from the first minute of life, they may need endotracheal intubation, bagging with 1.0 Atmosphere oxygen and intravenous fluids to make them survive. This acute presentation of severe biochemical metabolic disease may have fatal results. The last neonatal presentation is often confused with sepsis, and sepsis usually will not be ruled out unless all cultures come back negative, or another diagnosis confirmed.

Later in infancy, juvenile onset of metabolic disorders may present with bizarre symptoms affecting multiple body systems separately or in combination with central nervous system, cardiac, or other organs involvement. The diagnosis is difficult based on family history and physical examination alone, proper relevant testing yield accurate diagnosis.

Other metabolic disorders may not present until later in childhood or even until early adulthood. The presentation of these late onset disorders includes failure to thrive or easy fatigue with no known cause of onset. Examples of late onset errors of metabolism include Glycogen Storage diseases, such as Mc- Ardle (GSD III) and others.

Clearly newborn screening programs are essential to identify these disorders before these symptoms occur or irreversible brain damage occurs. Many of these diseases will benefit from early detection, and early start of medical intervention. Furthermore, newborn screening programs are important for families in the future by allowing them to obtain genetic counseling and testing that will help them make decisions regarding future pregnancy [2].

Methods

NBS technologies

Population based newborn screening became possible with the introduction of the Guthrie test for Hyperphenylalaninemia (PKU) in 1961. Recent advances in diagnostic techniques have substantially increased the number of conditions that can be detected from a single dried blood spot card.

Tandem Mass Spectroscopy

Tandem mass spectrometry (MS/MS), (Sweetman) has gotten increased attention since it was first added to the newborn screening programs [3]. The technology of MS/MS consist of two mass spectrometers coupled, result are displayed by computer as a mass spectrum profile. MS/MS can screen for disorders of amino acids, organic acid metabolism, and fatty acid oxidation and other conditions. A few drops or even one drop of blood is enough for MS/MS, and it has a very low false positive rate. For example false positive rates are estimated to be 0.26% compared to 1.5%, reported by the New England Screening Program for which used traditional bacterial essay methodology [4].

Al-Dirbashi et al. [5] reported a new LC-MS/MS application to detect different amino acid and organic acid metabolism in Saudi Arabia, added to the usefulness of this technology for detection of conditions in the newborn screening programs.

MS/MS was first introduced to Saudi Arabia in (2004), it was set up to screen for 23 metabolic diseases as well as Biotinidase defiency, Congenital Hypothyroidism (CH), and Congenital Adrenal Hyperplasia (CAH), the methods was set to be used in both Qatar and Saudi Arabia by the year 2007-2008 [6].

DNA-based Techniques

DNA techniques have also been introduced to newborn screening programs in recent years. . DNA arrays and sequencing have proved a more accurate tool for newborn screening programs, however they also can add to the cost of screening. DNA based method storage with other advanced technology like MS/MS, IEF, and HPLC and labeled bead technology have added to the success of detecting conditions and recommended for use by the American Newborn screening programs expert group [1].

Current state of Newborn Screening in the Middle East and Saudi- Arabia

By the year, 2009 there are only five countries in the Middle East that are executing voluntary national newborn screening programs:

Saudi Arabia: Saudi Arabia started national screening for CH since 1991. The program expanded in 2007 to include 23 other diseases tested.

Oman: Screening for hypothyroidism has taken place since 2004. Expansion to screen for more conditions is in process.

Qatar: In 2004, the Qatari newborn screening program started, but with 23 conditions screened in a national program.

United Arab Emirates: In 1995, PKU screening, was began and in 1998, CH, screening was in 2002, for Sickle Cell Disease (SCD).

Egypt: Egypt has now a partial national screening program for CH, which test 75% of the newborn population. As Egypt is the largest Arab country in population. El Nekley (2004) reported that after testing a total of 4,778,549 newborns, the incidence of hypothyroidism is 1: 2020 [6].

The Arab League consists of 22 different countries, and only these five countries have newborn screening programs in their lands. Saudi Arabia has the most potential to increase it is screening program in the Arab League as it started the phase one of expanded national screening for 16 diseases in 2005, but not in all of the regions of Saudi Arabia [6].

There are three stakeholders guiding the development of Newborn Screening Programs in Saudi Arabia

1) Ministry of Health (MOH);

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2) King Faisal Specialist Hospital and Research Center (KFSH@RC); and

3) Prince Salman Disability Research Center (PSDR). Each institute can have a different role in the process.

Ministry of Health (MOH)

Ministry of Health in Saudi Arabia (MOH) has the primary responsibility of Newborn Screening in the whole country. With it is huge budget and recourses it has at least one big hospital in each of the five regions of Saudi Arabia. This hospital could be the primary driving force for the proposed national newborn screening programs in the whole country. The MOH is the only one of the three instistutions with the potential for the screening outside the capital region.

King Faisal Specialist Hospital and Research Center

From 2005, to present King Faisal Specialist Hospital and Research Center (KFSH@RC), located in central region of Saudi Arabia, in the capital Riyadh, started screening for congenital hypothyroidism (CH) in 1991. The program was expanded in 2007 to test more conditions. This program was sponsored by the other shareholders including the namely MOH and PSDR. However the program only screened 25% of the neonates population in the country, and only in one region out of five. The plan is to gradually expand the coverage to reach 50% by the end of the year 2009 [7].

King Faisal Specialist Hospital and research Center in Riyadh, recently made available technique useful for genetics problems in the Middle East. These includes: GS/MS, DNA papers for newborn screening, a light cycler or NanoChip system for hetrozygote detection for Premarital Genetic Diagnosis (PGD), DNA Microarrays for karyotyping, and PGD mutation in preventive genetics [8].

Prince Salman Center for Disability Research [9]

Prince Salman Center for Disability Research (PSCDR) is also located in Riyadh, started to test for congenital hypothyroidism (HC) in 2005, collaborating with (KFSHRC) and (MOH). They became the third stakeholders of Newborn Screening Program in the capital Riyadh. As mentioned, only 25% of the population of Saudi Arabia is screened in only one region.

The 3 institutes work primarily in one region, the region of the capital Riyadh, unless they either expand their responsibility to cover the other remaining four regions, there will be no universal panel newborn screening program in the country.

A brief overview of the Kingdom of Saudi Arabia

Saudi Arabia was established as an independent nation when King Abdul Aziz Al Saud united different tribes in 1932. Of the citizens of Saudi Arabia, 90% are of ethnic Saudi and, 10% are of Afro-Asian descent, but carry the Saudi nationality. However, they are many non-citizens living in Saudi Arabia who have come for work, and are of different ethnicity. There is a relatively high birth rate (50-75%), with high percentage of first-cousin marriages. The annual birth rate is between 500,000- 800,000 babies are born each year [6].

In the Kingdom of Saudi Arabia, there are five regions; each of them has started a separate newborn screening program.

In the Kingdom of Saudi Arabia, there is an high prevalence of some inherited conditions due to the high rate of consanguineous marriages, large families, multiple marriages, tribal communities, condensed cities and empty rural areas (due to geographical and climate conditions, as most of the land is desert), also there is a lack of genetics education even within the educated communities [10].

There is a high rate of hemoglobinopathies, metabolic, neurogenic, and genetic diseases in the completely Arab countries as they share the same ancestors [6].

The Saudi government is promoting Saudi nationals to take over their country's huge opportunity for labor work, however, in reality there is millions of foreign workers living and working in Saudi Arabia. The population statistics published by Saudi government officials ranged between 7-8 million people living in Saudi-Arabia. This is important to know, because any attempt to plan for universal newborn screening program in Saudi Arabia should consider this large number of immigrants compared to the relatively small number of the total population. (Royal Saudi Embassy web site, 2010).

Most of the foreign labor forces are from Asia: India, Pakistan, and Bangladesh, Southeast Asia: the Philippines, Korea, and recently China. Immigrants are also from other Arab countries: Egypt, Sudan, Syria, Yemen, and others. There is also considerable number from Europe, North America, South America, and Austria.

Medical Framework

There are 314 hospitals in the Kingdom of Saudi Arabia. The largest are hospitals associated with the Ministry of Health hospitals. Other hospitals screening the community include: University hospitals, Armed Forces hospitals, Security Forces hospitals, National Guard hospitals, Aramco Medical Services, and the Royal Commission Medical Services.

There are also 1,761 Primary Health Care Centers in Saudi Arabia (MOH) and other non -MOH Primary Health Care facilities also exist in big cities, most are business that provides medical services to their own employee. There are also more than 200 Private hospitals in the Kingdom and not less than 75.

This are the main health system frame in Saudi Arabia. However there are other uncategorised health facilities are present in Saudi Arabia , including Saline Water Conversion Health services, other big companies health clinics, small personal infertility, cosmotics dermatology centers, and others. These facilities may have direct effect in Saudi Neoorn Screening programs as they might run prenatal or delivery services or neonatal follow up and immunization clinics.

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Insurance was introduced recently in Saudi Health system, but rapidly expanded after implementation of the health insurance law, which cover all employees in the private sector, Saudis as and foreigner All Saudis citizens have free access to any Ministry of Health facility, this also applies to any foreigner who works with the government, and others should seek private insurance provided by the employer In the last few years, some government hospitals in the three main cities in the Kingdom started to accept non-government employee who has insurance or cash payers.

Religious considerations

Ethnicity, consanguinity, and carrier rates (Figure 1[11] & Table 1 [12])

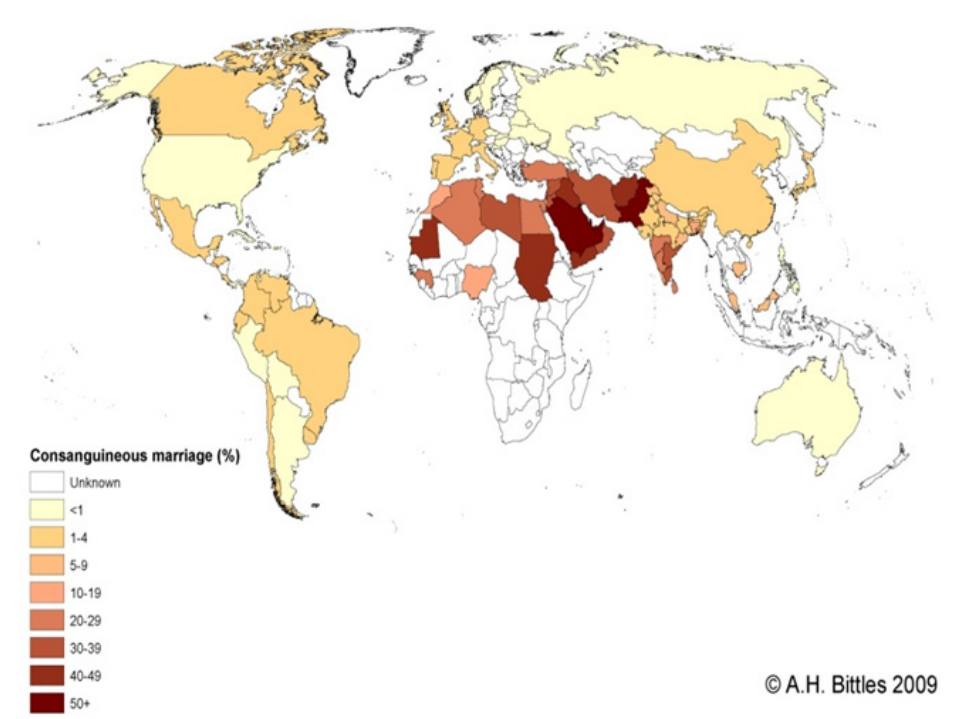

Figure 1: Global Consanguinity map, updated October 2009 (Consang.net) [11].

Table 1: Consanguinity rates in Saudi Arab populations. (Tadmouri, Nair and Obeid; Tadmouri, Nair and Obeid). Abbreviations: [?]=Unknown year of sampling or unknown types of consanguineous marriages; [>1C]=Double first-cousin marriage; [1C]=First-cousin marriage; [<1C]=Marriage beyond first- cousins; [1.5C]=First-cousin once removed marriage; [2C]=Second-cousin marriage; [<2C]=Marriage between distant relatives beyond second-cousins [12].

Location	Collection Period*	Sample Size	>1C ,1C*	Overall*	Reference
Riyadh	1983-1986	4,497	31	54.3 [?]	[99]
Riyadh	1993	2,001	28.4	51.1 [1C, 1.5C, 2C,<2C]	[67]
	1995 [?]	3,212	25.8	56.8 [1C, 1.5C, 2C,<2C]	[130]
Dammam	1998 [?]	1,307	39.3	52 [1C,1.5C, 2C,<2C]	[84]
Al-Baha	2004-2005	487	29	42.1 [?]	[131]
Al-Jouf	2004-2005	593	34.8	53.5 [?]	[131]
Assir	2004-2005	833	24.6	44.5 [?]	[131]
Eastern Province	2004-2005	1,032	33.3	57.8 [?]	[131]
Gizan	2004-2005	565	33	53.5 [?]	[131]
Hail	2004-2005	505	25.1	48.9 [?]	[131]
Madinah	2004-2005	618	39.2	67.2 [?]	[131]
Makkah	2004-2005	2,278	32.4	55.9 [?]	[131]
Najran	2004-2005	472	28.4	66.7 [?]	[131]
Northern Borders	2004-2005	504	31.4	63.9 [?]	[131]
Qassim	2004-2005	713	29.6	46.7 [?]	[131]

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Riyadh	2004-2005	2,522	42.3	60 [?]	[131]
Tabuk	2004-2005	432	28.3	60 [?]	[131]
All Saudi Arabia	2004-2005	11,554	33.6	56 [?]	[131]

a. Premarital screening

Many governments of the Arabic speaking world (Egypt, Syrian Arabic Republic, Lebanon, Morocco, and Saudi Arabia, for example) have been promoting premarital medical Screening. In Islam, it is acceptable for the use of temporary means of contraception if couple is agreeable, and no harm is likely to result. Donation of sperm, ovum, embryo, or motherhood surrogacy is limited to married couples. So there can be no third party sperm or egg donors [13].

In it is efforts to decrease the rate, and prevent genetic diseases, the Saudi Government introduced Fatwa (a permission not contradicting Islamic Laws) for the nessessiry of premarital testing for serious genetics disorders as, sickle cell trait and thalassemia. The Fatwa may be extended to include other genetic disorders, and definitly will contribute in decreasing the high rate of genetics disorders in Saudi Arabia [14].

Pre-marital screening program in Saudi Arabia went through a series of diffrent legistlation process before finally approved. The premarital consultation program is a powerful preventive measure to control the prevelance of inhereted diseases in a community like the Saudi community The program focused on hemoglobinopathies, but according to El-Hazmi, it will be expanded in the future to include other inherited diseases [15].

The importance of premarital screening program got great attention in the media and became a national goal . Because of the media efforts, this program [15].

b. Governmental oversight

It is well known to the public that Saudi government is spending a considerable amount of money in the health care system. Funding of newborn screening programs was started in 1989 by the national CH cord blood screening program in the 5 regions of Saudi Arabia and continues to be the primary goal of Saudi M.OH. The newborn screening program needs program registry and evaluation. Presently this is done now by King Faisal Specialist Hospital and Research Center and Prince Salman Disability resarch Center in Riyadh. However the program needs to be increased to cover the whole country. The Mistry of Health should have an essential role in this as it has hospital and regional laboratory in each of the five regions.

c. The ACMG Panel – a guideline

The need for a national Saudi newborn program is essential. Our suggession is to follow the guidelines:

Saudi Arabia has a diverse population like the USA, representing people from all over the world. The United States has 50 different newborn screening programs which operate independently, while in Saudi Arabia, there are 5 different regions with 5 different newborn screening programs which perform seperately [1]. Therefore the guidelines outlined by the ACMG can be useful for developing the screening program in the Saudi. The differences may lie in the incidence rates different disorders which needs to be considered in determining which diseases should be screening for [1].

Diseases in Saudi Arabia

Glutaric Acidemia: Glutaric Acidemia, a rare autosomal recessive disorder, due to mutation in Glutaryl Co A Dehydrogenase gene is relatively common in Saudi Arabia there is a higher rate in the country, by the year 1998, 24 patients was diagnosed in KFSH@RC, out of 80 cases in the world literature. The first patient diagnosed by MS/MS in Saudi Arabia was reported by Soufi et al. Other Aminoacidemias are also common in Saudi Arabia due to the same causes of intermarrage and consngeonity [16].

a. Hemoglobinopathies

At the Annual meeting of the WHO working Group on haemoglobinopathies held in Sardinia, April 1989. Professor Bernadette Modell from WHO collaborating center for control of heriditary diseases and University College London (UK) concluded that, guidelines for newborn screening programs should include both selectve testing in risky women, carrier women, and universal screening where all population should be screened.

Recent expansion of the Saudi Newborn Screening Program in Saudi followed the all population screening to all Saudi and non Saudi living in the Kingdom (WHO, 1989).

The prevalence of sickle cell disease in Saudi Arabia was studed in many regions in the country with different results according to the area. For example the eastern region of Saudi Arabia has the highest prevelance rate of sickle cell disease, while the northern region has the lowest prevalence [17].

In one study conducted in cities in the eastern province of Saudi Arabia, Nasserulla et al, reported the prevalence of homozygous sickle cell disease to reach 2.3% in Qatif and 1.08 in Al Hasa, hemoglobin Bartas 28% in Qatif and 16% in Al-Hasa. The sickle cell gene frequency was between (0.1109-0.1545%) in Al –Hasa and Qatif respectively. The authors concluded that neonatal screening program in this area should be of routine practice [18]. 10 years later, Al-Qurashie et al reported high prevalence of sickle cell diseases [17].

This study in the eastern region of Saudi Arabia near the Arabian Gulf, is labeled as the highest region in Saudi Arabia in hemoglobinopathies, and Qatif and Al-Hasa are the most two areas in the Kingdom, with high rate of consangeous marriages. This particular area will benefit most from the newborn screening program in general, specially for hemoglobinopathies [18].

These studies are very important in planning, regional newborn screening programs, as the planners of the project should

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not miss testing the common diseases in that area. However, another study done by El Hazmi, the authors concluded that due to the movement of people in the Kingdom, there are no significant differences in the prevalence of genetic diseases in different areas in the country [10].

Collaboration between Middle Eastern countries is essential, specially between what was known as the hemoglbinopathy gene belt, which extend from the sub-Saharan Africa, to the middle of Asia ending in India. Al-Mendlawi et al. [19] urged for this collaboration. The conserned countries have a different resourses in the form of wealthy Arab countries as the Gulf countries, manpower resources in the North African Arab countries, collaboration will create benefits to both sides [19].

Bahrain is located at the eastern boarder of Saudi Arabia in the Arabian Gulf, it is connected with Saudi Arabia by the 25 Kilometers long King Fahd, Causeway over the Gulf.

The Bahraini people share the eastern Saudis the same language, same Muslim religion, same ethnicity and the high rate of inter and consanguineous marriages. They are linked with the same tribes, traditions and share the same culture. The study of haemoglobinopathies done by Al-Arrayed et al. [20] showed decreasing rate of consanguinity between the present and the past generation, as there was no studies in the past generation, he was not able to compare the prevalence of haemoglobinopathies between the two generations. The prevalence of sickle cell disease is 2% in Bahraini population [20].

b. Cystic Fibrosis (CF)

Cystic fibrosis is inherited as autosomal recessive disease, characterized by pulmonary disease, pancreatic exocrine insufficiency, and meconium illus in the neonatal period, male infertility, and increase in the concentration of sweat electrolytes.

Cloning of the cystic fibrosis transmembrane regulator (CFTR) was completed in 1989; more than 750 new mutations have been reported to cystic fibrosis consortium. In Saudi Arabia 1:4, 243 children are reported, (Habib et al 1999) has CF, however the most common mutation in the European population was found to be rare in Saudi Arabia. Instead the most common Saudi Arabian mutation was found to be DF50 [21].

c. Congenital Adrenal Hyperplasia (CAH)

Congenital hypothyroidism can easly be missed by young unexperienced parents because the baby will be normal after delivery, with good weight, and no dysmorphic features. The full picture of overt hypothyroidism usually appears later, by that time, irreversible damage may have taken place in the brain of the neonate. This clinical picture underlines the importance of neonatal screening programs in diagnosing this treatable disorders. Abduljabar et al. [22] conducted a study in the newborn screening for hypothyroidism. They found the cord blood level of thyroid hormone is enough to screen for primary hypothyroidism in newborns. The fact that T4 is frequently normal in the first few days of life makes it nessessary to check the levels after the first five days of life, but combined with Thyroid Stimulating Hormone (TSH) test it will add to the 100% sesitivity and 98% specifity to the test [22].

The prevelance of CH (Congenital Hypothyroidism) using cord blood for testing was 1:4208 in newborn of Al Medina area at north western region of Saudi Arabia. This figure is almost the same as in other regions of the country, but higher than the world prevelance rate of CHAlMagasmi, al Hawsawi [23].

d. Newborn Hearing Screen

Transient Otoacoustic Emission for congenital deafness detection, is now used as a routine screening test in some big hospitals of Saudi Arabia. Between 1996-2004, Habib et al. [21] found the prevelance of confirmed bilateral congenital hearing loss to be between 0.17-0.18% in neonate delivered in the western region of Saudi Arabiathe study showed that the incidence of bilateral hearing loss to be: (0.17-.018%). Newborn congenital deafness was introduced and became a routine procedure to each neonate before disharge from the nursery routinely not less than 48 hours as per M.OH. regulation, otherwise the discharge will be againist medical advice. In many government and private hospital in Saudi Arabia, this recommendation is not followed for lack of trained personel to conduct and interpret the tests.Efforts are needed to make it routine in the whole country [21].

Newborn hearing screening in Riyadh, found the prevelance of hearing impairment up to 2.6% [24]. In another survey from different areas of Saudi Arabia [21]. The prevelance of hearing imparment was estimated to be around 13% with bilateral congenital sensorineural defness of 1.5%. More cases could be detected and treated if picked early by newborn screening programs, serious problems could have been prevented [24].

e. Glucose-6-Phosphate Dehydrogenase Deficiency (G6PD-D)

Glucose 6-phosphate dehydrogenase deficiency is an X-linked genetic disease, which can present with neonatal jaundice in the second day of postnatal life. Usually it cause vairable degree of hemolysis, and most cases respond to simple or double phototherapy or with no therapy. In rare occasions, if not diagnosed at an early time, it may present with high levels of hyperbilirubinemia, needing exchange transfusion. . In the Western part of Saudi Arabia the total prevelance was 2%; with a male: female ratio of 3:1; Although the disease is not usually life threatining the serum bilirubin may rise when the neonate went home from the hospital in the second day after delivery [25].

Conclusion

The purpose of this paper is to highlight the need of a national newborn screening program in Saudi Arabia. Saudi Arabia with it is big oil reserve need the organization of it is health system to stretch the maximum benefits of the resources for better services to it is own citizens. The newborn screening program is well established in the central region of Saudi Arabia by the help of KFSHRC and PSDC; it needs to expand to cover areas other than the

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central region. One way to achieve this goal is the reorganization of the newborn screening system plans under the leadership of MOH, which possess enough recourses distributed in the whole country to carry this responsibility. With its big budget, Saudi national health leader's planners, with the government usual support, Saudi National Newborn Screening Program will function, as it should be in a short period. MOH should implement plans to start testing for the maximum number of conditions in all it is five branches at one time and with the same diseases, as studies show that there is no single region immune from any disease, which is present in other regions.

References

1. American College of Medical Genetics Newborn Screening Expert Group (2006) Newborn screening: toward a uniform screening panel and system--executive summary. Pediatrics 117(5 Pt 2) (2006): S296-S307.
2. Burton BK (1998) Inborn errors of metabolism in infancy: a guide to diagnosis. Pediatrics 102(6): E69.
3. Sweetman L (2001) Newborn screening by tandem mass spectrometry: gaining experience. Clin Chem 47(11): 1937-1938.
4. Levy HL (1998) Newborn screening by tandem mass spectrometry: a new era. Clin Chem 44(12): 2401-2402.
5. Al-Dirbashi OY, Abu-Amero KK, Alswaid AF, Hoffmann GF, Al-Qahtani K, et al. (2007) LC-MS/MS determination of dibasic amino acids for the diagnosis of cystinuria. Application in a family affected by a novel splice-acceptor site mutation in the SLC7A9 gene. Journal of inherited metabolic disease 30(4): 611.
6. Saadallah AA, Rashed MS (2007) Newborn screening: experiences in the Middle East and North Africa. Journal of inherited metabolic disease 30(4): 482-489.
7. King Faisal Specialist Hospital and Research Center. n.d. 2010.
8. Ozand PT, Odaib AA, Sakati N, Al-Hellani AM (2005) Recently available techniques applicable to genetic problems in the Middle East. Community Genet 8(1): 44-47.
9. Prince Salman Center for Disability Research. n.d. 2010.
10. el-Hazmi MA (1999) Genetic diseases in Arab populations (1999) East Mediterr Health J 5(6): 1102-1103.
11. Consang.net. n.d. 31 May 2010.
12. Tadmouri GO, Nair P, Obeid T, Al Ali MT, Al Khaja N, et al. (2009) Consanguinity and reproductive health among Arabs. Reprod Health 6: 17.
13. Albar MA (1999) Counselling about genetic disease: an Islamic perspective. East Mediterr Health J 5(6): 1129-1133.
14. Al-Odaib AN, Abu-Amero KK, Ozand PT, Al-Hellani AM (2003) A new era for preventive genetic programs in the Arabian Peni. Saudi Med J 24(11): 1168-1175.
15. El-Hazmi MA (2004) The natural history and the national pre-marital screening program in Saudi Arabia. Saudi Med J 25(11): 1549-1554.
16. Soufi S, Rashed MS, Al Essa M, Bucknall MP, Refi A, et al. (1998) Glutaric acidemia type 1: First Saudi patient diagnosed by tandem mass spectrometry-based neonatal screening. Annals of Saudi medicine 18(2): 160-163.
17. Al-Qurashi MM, El-Mouzan MI, Al-Herbish AS, Al-Salloum AA, Al-Omar AA (2008) The prevalence of sickle cell disease in Saudi children and adolescents. A community-based survey. Saudi Med J 29(10): 1480-1483.
18. Nasserullah Z, Al Jame A, Abu Srair H, Al Qatari G, Al Naim S, et al. (1998) Neonatal screening for sickle cell disease, glucose-6-phosphate dehydrogenase deficiency and a-thalassemia in Qatif and Al Hasa. Ann Saudi Med 18(4): 289-292.
19. Al-Mendalawi MD (2009) The prevalence of sickle cell anemia in Saudi children and adolescents. A community-based survey. Saudi Med J 30(3): 452.
20. Al-Arrayed SS (1999) Review of the spectrum of genetic diseases in Bahrain. East Mediterr Health J 5(6): 1114-1120.
21. Habib HS, Abdelgaffar H (2005) Neonatal hearing screening with transient evoked otoacoustic emissions in Western Saudi Arabia. Int J Pediatr Otorhinolaryngol 69(2005): 839-842.
22. Abduljabbar M, Al Shahri A, Afifi A (2009) Is umbilical cord blood total thyroxin measurement effective in newborn screening for hypothyroidism? Journal of medical screening 16(3): 119-123.
23. Al-Maghamsi MS, Al-Hawsawi ZM, Ghulam GN, Okasha AM (2002) Screening for congenital hypothyroidism in North-West region of Saudi Arabia.Saudi medical journal 23.12 (2002): 1518-1521.
24. Zakzouk SM (2003) Universal newborn hearing screening. Saudi Med J 24.3 (2003): 245-247.
25. Muzaffer MA (2005) Neonatal screening of glucose-6-phosphate dehydrogenase deficiency in Yanbu, Saudi Arabia. J Med Screen 12(4): 170-171.

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