

Relative prevalence of various types of strabismus in patients attending NGO's medical centers in Gaza Strip

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Abstract: Research question: what is the relative prevalence of various types of strabismus in Gaza strip? Objective: to determine the most common types of strabismus in people who live in Gaza strip. Study design: a population-based sample of people with strabismus living in Gaza strip. Setting: NGO's medical centers of Gaza Strip – Palestine namely "Eye specialty hospital of the Public Aid Society" located in Gaza city, "ophthalmology clinic of Yaffa hospital" located in Deir Elbalah city and ophthalmology clinic of "Abu Madkour Medical center" located in Rafah city. Participants: patients with any type of strabismus attending those centers. Study period: 4th November 2012 to 4th May 2013 .Sample size: 226 cases which included 122 females and 104 males. Study variables: type of strabismus by gender, refractive error and degree of consanguinity between parents of those patients. Statistical analysis: SPSS was used for all statistical analyses. Results: esotropia is the most prevalent type of strabismus in Gaza Strip reaching 55.3% of all strabismus patients, exotropia comes second reaching 29.7%, followed by paralytic and restrictive strabismus (7.9% and 6.2% respectively). The most common association with those types of strabismus was inferior oblique overaction reaching 16.8% of all cases. Conclusions: esotropia and exotropia respectively are the most common types of strabismus in Gaza strip. These data support the assumption that strabismus screening of children in developing countries could be useful in early detection of strabismus, appropriate management of it and prevention of strabismic amblyopia.

Keywords: Relative Prevalence, Types of Strabismus, NGOs, Gender, Refractive Error, Consanguinity

1. Introduction

Strabismus is a common presenting ocular problem at outpatient clinics of ophthalmology. Many studies were conducted in the field of strabismus including those talking about the prevalence of strabismus and its types.

Abeba Tekle Giorgis and Abebe Bejiga conducted a study on preschool children in Butajira town in Ethiopia. They found that esotropia is the commonest type of strabismus (69%) followed by exotropia (24%)¹.

According to the Baltimore Pediatric Eye Disease Study manifest strabismus was found in 3.3% of white and 2.1% of African American children and esotropia and exotropia each accounted for close to half of all strabismus in both groups².

In their study conducted in Okayama Prefecture in Japan in 2003 on The prevalence of strabismus and amblyopia in Japanese elementary school children T. Matsuo and C.

Matsuo found that the prevalence of strabismus is 1.28% and exotropia was the most prevalent than any other type of squint³.

Strabismus consists a medical, social and psychological problem. The concept of binocular single vision in which both eyes work together as a team in order to obtain a single stereoscopic image of the object of regard is not valid in the presence of strabismus. At the onset of a squint two sensory perceptions arise based on the normal projection of the retinal areas stimulated; confusion and pathological diplopia may result⁴. These sensations are dealt with by suppression or anomalous retinal correspondence (sensory adaptations) or by anomalous head posture (motor adaptation). Suppression if monocular and persistent may lead to strabismic amblyopia .

At the other hand anomalous retinal correspondence will

regain some binocularity but it will not be as good as that based on normal retinal correspondence.

Population based data concerning the prevalence of strabismus or the relative prevalence of its types is not readily available for Palestine.

This study was carried out in three NGO's medical center's. Patients with any type of squint attending those centers in the period from 4th November 2012 to 4th May 2013 were included in the study.

This study presents the relative prevalence of various types of squint by gender, refractive error and degree of consanguinity between parents of those patients.

This information may be used for planning appropriate eye care program for high risk groups in order to reduce the burden of strabismus and strabismic amblyopia.

2. Materials and Methods

This study was designed to describe types of strabismus in a population-based sample of people with strabismus living in Gaza strip. 226 cases were enrolled in the study, of them there were 122 (54%) females and 104 (46%) males. Data were collected between 4th November 2012 and 4th May 2013 from people who visited the clinic of Eye Specialty Hospital, ophthalmology clinic of Yaffa hospital and ophthalmology clinic of AbuMadkour Medical Center located in Gaza, Deir Elbalah and Rafah cities respectively.

Each patient underwent ophthalmic examination as follows: refraction without cycloplegia (and with cycloplegia if under 15 years old), strabismus evaluation at distance and near without and with glasses (if he/she wears glasses), ocular versions and any other associations with strabismus (inferior oblique overaction, dissociated vertical deviation, alphabetical pattern etc.).

Also each patient or parents were asked if the parents of the patient are related to each other "consanguinous" and what is the degree of consanguinity between them.

Every patient was categorized into one of four groups of strabismus: esotropia, exotropia, paralytic and restrictive strabismus.

Any case that does not fit into any of the four groups was categorized as "other types of strabismus" (e.g. primary inferior oblique overaction).

SPSS was used for all statistical analyses. Prevalence was calculated as the ratio of the number of individuals with any type of strabismus to the total number evaluated.

3. Results

The average age of all patients was 7.65 years and ranged from 4 months to 39 years old. The average age of females (7.38 years) and males (7.97 years). Among 226 cases with strabismus there were 122 (54%) females and 104 (46%) males, 125 cases(55.3%) had esotropia, 67 cases (29.7%) had exotropia, 14 cases (6.2%) had restrictive strabismus, 18 (7.9%) had paralytic strabismus and only 2 (0.9%) cases had other types of strabismus.

Table 1. the relative prevalence of various types of strabismus to the total number of strabismus cases.

Type of strabismus	Gender				Total	
	Female		Male		N	%
	N	%	N	%		
Esotropia	64	51.2	61	48.8	125	55.3
Exotropia	38	56.7	29	43.2	67	29.6
Restrictive strabismus	9	64.2	5	35.7	14	6.2
Paralytic strabismus	10	55.5	8	44.4	18	8
Other types	1	50	1	50	2	0.9
Total	122		104		226	100.0

From table 1 the most prevalent type of squint is esotropia, exotropia comes second followed by paralytic and restrictive strabismus respectively. This sequence keeps true regardless of gender.

Table 2. spherical refractive error for right eye in patients with various types of strabismus.

Refractive error	Right eye							
	Esotropia		Exotropia		Restrictive strabismus		Paralytic strabismus	
	N	%	N	%	N	%	N	%
No R.E.	3	2.4	14	20.9	4	28.6	6	33.3
Low hyperopia	18	14.4	34	50.7	6	42.9	6	33.3
Moderate hyperopia	58	46.4	9	13.4	3	21.4	2	11.1
High hyperopia	44	35.2	0	0.0	0	0.0	2	11.1
Low myopia	2	1.6	7	10.4	1	7.1	1	5.6
Moderate myopia	0	0.0	3	4.5	0	0.0	0	0.0
High myopia	0	0.0	0	0.0	0	0.0	1	5.6
total	125	100	67	100	14	100	18	100

Table 3. spherical refractive error for left eye in patients with various types of strabismus.

Refractive error	Left eye							
	Esotropia		Exotropia		Restrictive strabismus		Paralytic strabismus	
	N	%	N	%	N	%	N	%
No R.E.	2	1.6	12	17.9	4	28.6	6	33.3
Low hyperopia	17	13.6	32	47.8	8	57.1	5	27.8
Moderate hyperopia	56	44.8	11	16.4	1	7.1	2	11.1
High hyperopia	48	38.4	0	0.0	0	0.0	3	16.7
Low myopia	1	0.8	9	13.4	1	7.1	1	5.6
Moderate myopia	1	0.8	1	1.5	0	0.0	0	0.0
High myopia	0	0	2	3.0	0	0.0	1	5.6
Total	125	100	67	100	14	100	18	100

From tables 2 and 3 the most prevalent refractive error in esotropia patients is hyperopia regardless of eye, especially moderate and high degrees of hyperopia, while in exotropia low hyperopia is the most prevalent refractive error

irrespective of eye.

Also in restrictive and paralytic strabismus patients, hyperopia is the most prevalent refractive error, with all severities of this refractive error represented in paralytic strabismus, while high degrees of hyperopia are not seen in restrictive strabismus patients and this keeps true for both eyes.

Table 4. right eye astigmatism in patients with various types of strabismus.

Severity of astigmatism	Right eye							
	Esotropia		Exotropia		Restrictive strabismus		Paralytic strabismus	
	N	%	N	%	N	%	N	%
No astigmatism	29	23.2	19	28.4	6	42.9	8	44.4
Mild astigmatism	46	36.8	28	41.8	2	14.3	7	38.9
Moderate astigmatism	41	32.8	17	25.4	5	35.7	2	11.1
Severe astigmatism	9	7.2	3	4.5	1	7.1	1	5.6
total	125	100	67	100	14	100	18	100

Table 6. right eye axis of astigmatism in patients with various types of strabismus.

Axis of astigmatism	Right eye							
	Esotropia		Exotropia		Restrictive strabismus		Paralytic strabismus	
	N	%	N	%	N	%	N	%
No astigmatism	29	23.2	19	28.4	6	42.9	8	44.4
With the rule	71	56.8	34	50.7	5	35.7	6	33.3
Against the rule	11	8.8	9	13.4	1	7.1	2	11.1
Oblique	14	11.2	5	7.5	2	14.3	2	11.1
total	125	100	67	100	14	100	18	100

Table 7. left eye axis of astigmatism in patients with various types of strabismus.

Axis of astigmatism	Left eye							
	Esotropia		Exotropia		Restrictive strabismus		Paralytic strabismus	
	N	%	N	%	N	%	N	%
No astigmatism	27	21.6	18	26.9	6	42.9	11	61.1
with the rule	77	61.6	36	53.7	6	42.9	4	22.2
against the rule	16	12.8	9	13.4	1	7.1	1	5.6
oblique	5	4.0	4	6.0	1	7.1	2	11.1
Total	125	100	67	100	14	100	18	100

Tables 6 and 7 show that in strabismic patients who have astigmatism, with the rule astigmatism is the most prevalent axis irrespective of eye or type of strabismus.

The most common association with strabismus in general was inferior oblique overaction, followed by dissociated vertical deviation. Other associations were relatively rare (table 8).

Table 5. left eye astigmatism in patients with various types of strabismus.

Severity of astigmatism	Left eye							
	Esotropia		Exotropia		Restrictive strabismus		Paralytic strabismus	
	N	%	N	%	N	%	N	%
No astigmatism	27	21.6	18	26.9	6	42.9	11	61.1
Mild astigmatism	45	36	23	34.3	4	28.6	5	27.8
Moderate astigmatism	44	35.2	18	26.9	1	7.1	1	5.6
Severe astigmatism	9	7.2	8	11.9	3	21.4	1	5.6
Total	125	100	67	100	14	100	18	100

Tables 4 and 5 show that in strabismic patients who have astigmatism, mild astigmatism is the most predominant among other severities irrespective of eye, with only one exception for right eye in patients with restrictive strabismus in which moderate degrees of astigmatism predominates.

Table 8. signs associated with various types of strabismus.

association	N	%
No association	169	74.8
Inferior Oblique Overaction	38	16.8
Dissociated Vertical Deviation	8	3.5
A pattern	1	0.44
V pattern	2	0.9
Up shoot	3	1.3
Manifest nystagmus	6	2.7
Latent nystagmus	2	0.9
MGJWS*	1	0.44

Marcus Gunn Jaw Winking Syndrome.

Table 9. percentage of consanguineous parents of strabismic patients.

Degree of consanguinity	Esotropia			Exotropia			Restrictive strabismus			Paralytic strabismus			Grand Total %
	Female %	Male %	Total %	Female %	Male %	Total %	Female %	Male %	Total %	Female %	Male %	Total %	
No consanguinity	20.5	29.5	50.0	34.1	20.5	54.5	22.2	22.2	44.4	22.2	11.1	33.3	50.0
1 st degree relativity	23.1	17.9	41.0	13.6	20.5	34.1	33.3	11.1	44.4	22.2	22.2	44.4	39.3
2 nd degree relativity	3.8	3.8	7.7	9.1	2.3	11.4	11.1	0.0	11.1	22.2	0.0	22.2	10.0
3 rd degree relativity	0.0	1.3	1.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7

Finally table 9 shows that in general 50% of parents of strabismic patients have no relativity to each other while the other 50% they have various degrees of relativity and that first degree relativity constitutes 39.3% of the total number studied .

4. Discussion

First of all an idea must be given about NGOs working in Gaza Strip in the field of ophthalmology. In fact many NGOs here in Gaza Strip offer medical service for the population (including ophthalmological service). Of those NGOs some have particular importance. for example ophthalmological service in the middle governorate of Gaza strip is only offered by the NGOs' ophthalmic clinics , the biggest of which is Yaffa ophthalmic clinic (as there is no governmental ophthalmic service in this region). Also the Eye Specialty Hospital of the Public Aid Society is the largest NGO offering ophthalmological service all over Gaza strip.

In the present study esotropia was found to be the most common type of strabismus in Gaza strip, and the accommodative esotropia was found to be the most common type of esotropia (table 10) irrespective of gender. Partially accommodative esotropia comes second, followed by early onset esotropia.

Table 10. prevalence of various types of esotropia related to the total number of esotropic patients.

Esotropia	Gender				Total	
	Female		Male			
	N	%	N	%	N	%
accommodative ET	26	40.6	25	41.0	51	40.8
Partially accommodative ET	20	31.3	22	36.1	42	33.6
Early onset ET	16	25.0	11	18.0	27	21.6
Consecutive ET	1	1.6	0	0	1	0.8
Sensory ET	0	0	1	1.6	1	0.8
Distance ET	0	0	1	1.6	1	0.8
Basic ET	1	1.6	1	1.6	2	1.6
Total	64	100	61	100	125	100.0

These results corresponds with results of the western studies. For example according to one of those studies children with accommodative esotropia accounted for more than half of patients5.

Another study found that fully accommodative esotropia consisted 36.4% of all esotropia cases.6

It is worthy to note that in studies performed on east Asia people exotropia was the most common type of strabismus.

According to one "Survey of Strabismus among School-Children in Korea" 322 cases of strabismus included 262(81.4%)exodeviation and 60(18.6%) esodeviation7.

Talking about exotropia, which came second in prevalence after esotropia, the intermittent type was the most prevalent one among other types of exotropia and consisted 62.7% of all exotropia cases (table 11).

Table 11. prevalence of various types of exotropia related to the total number of exotropic patients.

Exotropia	Gender				Total	
	Female		Male			
	N	%	N	%	N	%
Constant (early onset) exotropia	7	18.4	8	27.6	15	22.4
Intermittent XT	24	63.2	18	62.1	42	62.7
sensory XT	1	2.6	1	3.4	2	3.0
consecutive XT	6	15.8	2	6.9	8	11.9
Total	38	100	29	100	67	100

Incomitant types of strabismus "paralytic and restrictive types" were less frequently seen and they together consisted 14.1% of all cases, so they are not common types but also not so rare.

David Stidwill found paretic strabismus to constitute 10% of strabismic patients in his study8.

Hypermetropic refractive error in general was the most prevalent spherical refractive error irrespective of eye, gender or type of squint. This may be due to the fact that most of cases are children (66.3 % of cases are under 10 years of age and 82% are under 15 years of age).

Moderate and high degrees of hypermetropia were seen in patients with esotropia and this is logic, because significant hypermetropic refractive error is the pathophysiologic start point for refractive accommodative esotropia (fully accommodative and partially accommodative).

Mild degree of astigmatism was the most common among other severities and with the rule astigmatism was the most prevalent axis. Again in children with the rule astigmatism is suspected to be the most common because of eyelid pressure.

Inferior oblique overaction was the most common association with strabismus. In fact inferior oblique overaction was seen mostly in early onset esotropia and in

superior oblique palsy patients .Dissociated vertical deviation was the second most common association and it was found in early onset esotropia and early onset exotropia .

Finally half of strabismic patients have parents who are related to each other while the other half have parents who are not related to each other.

In fact during ophthalmology practice in Gaza strip from 2007 till now it was noted that particular types of squint is seen frequently in members of some families. For example: one family in Rafah city has accommodative esotropia in most – if not all - of its members.

In another family from Gaza city three cases with intermittent XT were operated and another 2 cases from the same family were diagnosed with the same diagnosis.

A control group of people who have not any type of strabismus may be needed for comparison to explore in detail the effect of consanguinous marriage on strabismus.

5. Conclusion

1. Esotropia is the most common type of strabismus in strabismic patients attending NGOs medical centers in Gaza strip.
2. Hypermetropia is the most common refractive error in strabismic patients, with moderate and higher degrees found mostly in esotropia.
3. Mild with the rule astigmatism is the most common type of astigmatism in strabismic patients.
4. Inferior oblique overaction is the most common sign associated with strabismus specially early onset esotropia and 4th nerve palsy.
5. Consanguinity between parents of strabismic patients may have a role in the development of strabismus.
6. These data support the assumption that strabismus screening of children in developing countries could be useful in early detection of strabismus, appropriate management of it and prevention of strabismic amblyopia.

Recommendations

Early screening and early detection of strabismus is very important for appropriate management of strabismus and strabismic amblyopia.

Cycloplegic refraction is mandatory in early childhood in patients with strabismus to know the total amount of particular refractive error and to make decision regarding

the method of treatment of strabismus.

Associated signs with any type of strabismus must be taken into account and any specific pattern must be recognized as this may help in differential diagnosis between various strabismic entities and may alter the technique of surgical correction, should it be required.

Another study comparing the consanguinity between parents of strabismic patient to that between parents of a control group will explore the effect of consanguinous marriage on strabismus.

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