Serum-epidemiological survey in a group of illegal immigrates for the evaluation of immunity against vaccine-preventable diseases in Italy

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ABSTRACT

BACKGROUND: During the period May 2004 – December 2005 a serum epidemiological survey for preventable diseases through compulsory vaccination in Italy (diphtheria, tetanus, poliovirus, and hepatitis B) and rubella in women was performed in a group of adult and illegal immigrants living in Rome, to evaluate the relationship between vaccination coverage and socio-demographic characteristics.

METHODS: Serological exams were carried out by Elisa test (for rubella, tetanus, diphtheria and hepatitis B) and by neutralizing antibody titration (Poliovirus).

Both descriptive analyses and inferential statistics (hypothesis tests) were used.

RESULTS: Out of 667 immigrants who were invited, 318 of them participated in the study (participation rate = 47.6 %).

The percentages of immunized individuals were: 39.1% for diphtheria (basic immunization 59.3%), 74.8% for tetanus, 74.1% for poliomyelitis, and 94.7% for rubella. Among Eastern European subjects, Poliovirus vaccination coverage was lower than 70%. With regard to rubella, African women had the lowest coverage (87.5%). Only 2.8% was vaccinated against hepatitis B. Over half of immigrants were healthy carriers for HBV.

CONCLUSIONS: Our results underline the unexpressed health needs of the migrant population. European countries should pay more attention to promote immigrants' health since their entrance in the new communities.

Key words: Immigrants'health; Vaccinations; Serum–epidemiological survey; Vaccination coverage

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INTRODUCTION

The social-demographic phenomenon of immigration had an exponential increase in Italy from the end of the seventies [1]. According to census data, during the years of the first immigration law (Martelli law n°39 1990), immigrants were about 781,138, while after the Turco-Napolitano law (law n°40 March 1998) the number increased to 1,340,153 [1]. During the last regularisation, later on the Bossi-Fini law (law n.189 July 30th 2002) the legal status of 705,138 irregular immigrants was settled. According to Eurispes data, there are about 2.6 millions immigrants with stay permission in Italy now, accounting for 4% of the Italian population [2]. Although this figure is lower than the European average (5.2%), it does not include illegal immigrants, which are estimated to be about 800 thousand subjects [2]. However, the official source of this data (residence permits granted by the police headquarters and census data) cannot be considered exhaustive because the actual number of illegal immigrants is difficult to assess.

The Italian laws guarantee the immigrant's access to health care services [3]. The indigent immigrants without a residence permit can benefit from free health care services and preventive medicine programmes, thanks to the release of the "Transitorily Present Strangers card" (TPS card), by National Health Service (NHS) structures (Deliberazione di G.R. 5122/97).

However, due to poor housing conditions, precarious economic situation, new living environment, irregular job, and other factors these people are at a high risk of communicable and psychiatric diseases [4], occupational injuries and pregnancy health problems [5]. Several studies so far assessed vaccination coverage against all Hepatitis viruses and Polioviruses [6] among immigrants in refugee camps in Apulia [7-8], which is a place of immigrants arrival because of its geographical position [9]. Other studies were carried out in Veneto [10] to evaluate the immigrant's vaccination coverage against Poliovirus. According to these, immigrants' vaccination status does not appear so critical, although surveillance system and vaccination programmes are necessary to protect the new integrated community.

The aim of this study was to perform a serum epidemiological survey for preventable diseases through compulsory vaccination in Italy (diphtheria, tetanus, poliovirus, hepatitis B) and rubella (in women at fertile age only) in a sample of illegal immigrants coming from different countries, as well as to evaluate the relationship between vaccination coverage and socio-demographic characteristics.

METHODS

This survey was carried out during the period of May 2004 - December 2005 in a sample of 18-69 years old immigrants, without residence permission. The first approach with immigrants took place at Caritas outpatient clinic (Caritas is a non profit organisation that helps indigent people). The voluntary physicians identified the diagnostic pathway and gave explanations about the survey: they collected an informed consent prepared according to CIOMS (Council for International Organizations of Medical Sciences) guidelines [12], which was translated in Italian, Chinese, Arabic, Romanian, Spanish, French, English, and Ukrainian languages. An illustrated brochure describing the pathway was handed to immigrants to facilitate the access to the hospital that provided the laboratory services and to permit their identification by nursing staff.

The following data was collected from Caritas medical records: gender, age, country of origin, civil status, school attendance, years of arrival in Italy, occupation, stay permission, TSP, date of blood analysis prescription, date of blood specimen arrival, Caritas outpatient clinic code. According to the "statistical dossier of WHO vaccine-preventable diseases: monitoring system", the countries were classified into geographical areas and four socio-economic development levels (the first one is the equivalent of the advanced regions, the last one is representative of the most deprived countries) [12].

Serological analyses

The serological survey was carried out by Elisa test (DiaSorin S.p.A., Saluggia,Vercelli) for rubella, tetanus, diphtheria and hepatitis B. Antibodies (IgG and IgM) against Rubella virus, antibodies (IgG) against Clostridium tetani toxin, antibodies (IgG) against Corynebacterium diphteriae toxin, markers and antibodies against Hepatitis B (HbsAg, total Ig against HbsAg, total Ig against HbcAg, IgM against HbcAg) were tested. The Elisa tests for antibodies

(IgM) against Rubella virus, HbsAg, antibodies (Ig total) against HbcAg, IgM against HbcAg represent a qualitative, while all the others were quantitative analysis.

Immigrants with IgG diphtheria antitoxin levels > 0.1 UI/ml were considered immunized; <0.01 UI/ml not immunized, between 0.01-0.09 UI/ml with a basic immunization (BI)[13]. The immigrants with a level of antibodies against Clostridium tetanii toxin > 0.10 UI/ml were considered immunized [13]. Women with IgG antibodies against rubella >10 IU/ml and IgM antibodies absence were considered protected.

The serological survey for Poliovirus (serotype 1, 2, 3) was carried out by neutralizing antibody titration [14]. Hep2-Cincinnati cells were used (6000 cells for well in 100 ml of thinner). The Sabin strains of Poliovirus types 1, 2, and 3 (available through GPV/EPI, WHO/ Geneva) were titrated three times to contain 100 TCD 50. Each serum dilution was tested at least in triplicate. The serum antibody titre is the highest dilution of serum, which protects 50% of the culture against 100 TCD 50 of challenge virus. Antibody titres from 1:2 to 1:256 were expressed as reciprocals (e.g. titre of 1/256= 256). We considered immigrants as protected if their antibodies titles were greater than 1:8 for all Poliovirus serotypes [13].

Statistical analyses

Both descriptive analyses (counts and percentages) and inferential statistics (hypothesis tests) were used. A p value of 0.05 or lower was considered statistically significant. For nominal variables Chi-square test was used, while a test for trend was used in the case of ordinal variables. The binomial exact test was used when two-way tables contained at least one cell with an expected count lower than 5. Mantel-Haenszel procedure was used to compare the proportion of immunized subjects against specific diseases according to level of economic development adjusting for age and gender.

RESULTS

Of the 667 immigrants eligible for the inclusion, 318 performed the required analysis (participation rate 47.6%). The socio-demographic characteristics of the included immigrants are reported in Table 1. Most immigrants were from East European regions (EUR), West Pacific regions (PAC) and American regions (AME) (44.2%, 18.0%, and 17.0%, respectively). The smallest groups belonged to African regions (AFR), South East Asian regions (SEA) and Oriental Mediterranean regions (MED) (12.0%, 5.7%, 3.1%, respectively). More than half of immigrants arrived in Italy from 2003 to 2005. The education (school attendance) level was middle-high as 43.2% had 13 years of school attendance (lower secondary school). Only 41.0% had a job.

Table 2 reports the immigrants' immunological status for diphtheria, tetanus, poliomyelitis, and rubella.

Diphtheria

Among included subjects, 39.0% were immunized for diphtheria, while 59.4% had a BI (Table 2). All unprotected individuals were females (data not shown). The group coming from SEA had the best vaccination coverage, as 50.0% of this group was immunized for diphtheria and 50.0% had a BI (Table 2). The immigrants coming from PAC regions had the lowest coverage (22.8% immunized, 75.4% BI) (Table 2).

Tetanus

Women were more likely to be protected against tetanus than men (80.6% against 64.3%, p=0.001). The immigrants coming from EUR and AME had an adequate vaccination coverage (respectively 90.7% and 83.3%), while the group coming from MED had the lowest coverage (30.0%) (Table 2).

Adjusting for age and gender, subjects from level II countries were about seven times more likely to be immunised against tetanus in comparison to immigrants coming from level IV countries (OR=7.0; 95% CI: 2.3, 21.3) (data not shown). On the other hand, individuals of level III countries had similar odds of immunization against tetanus compared to those of level IV countries. The vaccination coverage was not correlated to the school attendance. Immigrants who arrived in Italy more recently were more protected towards the tetanus toxin than those who arrived in previous years (p< 0.001).

TABLE 1

SOCIO-DEMOGRAPHIC CHARACTERISTICS OF 318 IMMIGRANTS INCLUDED IN THE STUDY

	N	%
GENDER		
Male	112	35.2
Female	206	64.8
AGE		
18-29 years	90	28.3
30-39 years	104	32.7
> 40 years	124	39.0
COUNTRY OF ORIGIN (WHO REGION)		
African Region (AFR)	38	12.0
Region of the Americas (AME)	54	17.0
Eastern Mediterranean Region (MED	10	3.1
European Region (EUR)	140	44.2
South-East Asia Region (SEA)	18	5.7
Western Pacific Region (PAC)	57	18.0
ECONOMIC DEVELOPMENT*		
II	139	44.0
III	130	41.1
IV	47	14.9
YEAR OF ARRIVAL IN ITALY		
<1.1.1997	19	6.3
1997/1999	28	9.3
2000/2002	82	27.2
2003/2005	173	57.3
CIVIL STATUS		
Married	142	53.6
Singles	97	36.6
Divorced/Separated	22	8.3
Widowed	4	1.5
EDUCATION		
No formal education	31	10.0
Primary school	118	38.1
Lower Secondary school	134	43.2
Higher Secondary school	27	8.7
OCCUPATION		
Yes	129	41.0
No	186	59.1
STAY PERMISSION		
Yes	53	16.7
No	265	83.3

* Countries are divided into four groups by development status, according to 2004 Statistic Dossier by WHO. I Developed economies; II Economies in transition; III Developing economies; IV Least developing countries. In our sample there are not immigrant's coming from developed countries.

TABLE 2

SOCIO-DEMOGRAPHIC CHARACTERISTICS AND IMMUNOLOGICAL STATUS FOR DIPHTHERIA, TETANUS, POLIOMYELITIS, RUBELLA

	DIPHTHERIA			TETANUS		POLIOMYELITIS		RUBELLA	
	IMMUNIZED	BASIC IMMUNIZATION	P VALUE	IMMUNIZED	P VALUE	IMMUNIZED	P VALUE	IMMUNIZED	P VALUE
N	(124)	(189)		(238)		(235*)		(195**)	
GENDER									
Male	41.1	59.0	0.271	64.3	0.001	72.1	0.539	-	-
Female	37.9	59.7		80.6		75.2		94.7	
AGE									
18-29 years	46.7	51.1	0.123	74.4	0.995	76.7	0.793	93.3	0.200
30-39 years	39.4	60.6		75.0		73.8		91.5	
>40 years	33.1	64.5		75.0		72.6		97.7	
COUNTRY OF ORIGIN (WHO REGION)									
AFR	31.6	65.8	0.131	50.0	<0.001	76.3	0.463	87.5	0.016
AME	40.7	59.3		83.3		77.8		89.1	
MED	30.0	70.0		30.0		60.0		100.0	
EUR	46.0	52.1		90.7		70.0		99.0	
SEA	50.0	50.0		77.8		88.2		0.0	
PAC	22.8	75.4		50.9		77.2		92.1	
ECONOMIC DEVELOPMENT ¨									
II	46.0	52.1	0.060	90.7	<0.001	70.0	0.216	99.0	0.009
III	30.8	68.5		65.4		75.4		90.1	
IV	40.4	57.5		53.2		82.6		90.0	
EDUCATION									
No formal education	41.9	58.1	0.184	67.7	0.142	80.0	0.300	94.7	0.959
Primary school	33.9	65.2		70.3		67.8		93.2	
Lower Secondary school	41.8	56.7		79.8		76.9		95.5	
Higher Secondary school	48.2	44.4		85.2		77.8		95.2	
YEAR OF ARRIVAL IN ITALY									
<1997	42.1	57.9	0.279	42.1	<0.001	84.2	0.736	85.7	0.567
1997-99	21.4	78.6		60.7		71.4		94.7	
2000-02	34.2	64.6		73.2		74.4		96.2	
2003-05	43.4	54.9		81.5		72.7		94.1	
OCCUPATION									
Yes	43.4	54.3	0.302	79.1	0.129	76.7	0.336	94.3	0.873
No	36.6	62.4		71.5		71.9		94.8	

Row percentages for all variables are shown

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¨ See table 1.

* 1 missing value

** 12 missing values

Poliomyelitis

The immunity status against Poliovirus was acceptable, with 74.1% of the sample being protected against the disease (Table 2).

The immigrants coming from SEA regions had the best vaccination coverage (88.2%) (Table 2). The subjects coming from less developed countries (IV level) were more protected than the other ones (82.6%) but the difference was not statistically significant (Table 2).

The OR among males (adjusted for age and the effect of country of the origin) for being protected against poliomyelitis, was 0.2 (95% CI: 0.1, 0.8) for subjects of level II and level III countries in comparison to subjects coming from the most deprived regions (data not shown). Among females, ORs did not significantly differ from the null value. School attendance was not related to the vaccination coverage.

The immigrants that arrived in Italy before 1997 had a higher vaccination coverage (84.2%) than those that arrived between 2003 and 2005 (72.7%) but the difference was not statistically significant (Table 2).

Rubella

A greater proportion (94.7%) of women included in the study were protected (Table 2). There was a significant difference in immunization among women according to region of origin (p=0.016) (Table 2). The women coming from MED were all protected while women with the lowest level of coverage (87.5%) were from Africa (Table 2). Less developed countries (level III and IV) had significantly lower vaccination coverage than countries with an economy in transition (level II), (90.0% and 90.1%, respectively vs. 99%, p=0.009) (Table 2).

The women who arrived in Italy before 1997 had a lower coverage against rubella (85.7%) than those who arrived afterwards but the difference was not statistically significant. The school attendance was not related with vaccination coverage.

Hepatitis B

In Table 3 socio-demographic characteristics and immunological status for hepatitis B are reported. The men got infected more often than women (p value of 0.010). After the contagion by HBV virus, 32.4% of men and 18.9% of women had a recovery with immunization. The healthy carriers were more numerous among men than women (10.8% and 6.8%). The healthy carriers belonged to PAC (17.5%), MED (10.0%), EUR (8.6%), AFR (5.3%) and Americas (1.9%). Vaccinated immigrants were 2.8% and they belonged to SEA (11.1%), MED (10.0%), PAC (5.3%), AME (1.9%) and EUR (1.4%).

The school attendance was lower in the group of immigrants that got infected by the virus than in the healthy subjects (negative not vaccinated and vaccinated ones), with a p value of 0.005.

DISCUSSION

The results of our investigation show acceptable vaccination coverage, with some exceptions. Particularly, unprotected men towards tetanus are in full working age and the occupational categories and the illegal job expose them to a higher risk of disease.

The unprotected immigrants against tetanus have been staying in Italy since more time than the protected ones. Despite their long stay these subjects did not have access to tetanus vaccination like Italian people. An investigation about the Italian population coverage shows that the actual epidemiology of the tetanus reflects the vaccination offer [15]. Despite the great results achieved, the incidence of tetanus in Italy is still around 10 times higher than the European and American average [17]. As immigrants with higher school attendance show an acceptable coverage, maybe they developed a deeper sensibility towards prevention and public health interventions.

In regards to diphtheria coverage, we report a large group of immigrants with BI, who need a booster dose. However, a study on the Italian population previously reported that 30.2% of Italians would also need a booster dose, although only 9.9% are unprotected [17].

With the WHA 41.28 resolution (May 1988), WHO has included in the EPI programme the world eradication of Poliovirus. Nowadays America, Western Pacific and Europe are considered to be Polio-free (Epicentro, 2002). In our study, EUR immigrants have a vaccination coverage not greater than 70.0%.

TABLE 3

SOCIO-DEMOGRAPHIC CHARACTERISTICS AND IMMUNOLOGICAL STATUS FOR HEPATITIS B

	POST-VACCINE IMMUNIZATION	RECOVERY WITHOUT IMMUNIZATION	RECOVERY WITH IMMUNIZATION	HEALTHY CARRIER	NEGATIVE NOT VACCINATED	P VALUE
N	(9)	(33)	(75)	(26)	(175)	
GENDER						
Male	3.6	11.7	32.4	10.8	41.4	0.010
Female	2.4	9.7	18.9	6.8	62.1	
AGE CATEGORY						
18-29 years	5.6	6.7	20.0	12.2	55.6	0.348
30-39 years	1.9	10.7	27.2	5.8	54.4	
>40 years	1.6	12.9	23.4	7.3	54.8	
COUNTRY OF ORIGIN (WHO REGION)						
AFR	0.0	23.7	47.4	5.3	23.7	<0.001
AME	1.9	3.7	1.9	1.9	90.7	
MED	10.0	0.0	30.0	10.0	50.0	
EUR	1.4	7.2	20.1	8.6	62.6	
SEA	11.1	11.1	5.6	0.0	72.2	
PAC	5.3	17.5	40.4	17.5	19.3	
ECONOMIC DEVELOPMENT**						
II	1.4	7.2	20.1	8.6	62.6	0.152
III	4.6	10.8	24.6	8.5	51.5	
IV	2.1	19.2	29.8	6.4	42.6	
EDUCATION						
No formal education	3.2	12.9	22.6	22.6	38.7	0.005
Primary school	2.5	13.6	30.5	7.6	45.8	
Lower Secondary school	2.3	6.8	18.8	6.8	65.4	
Higher Secondary school	7.4	11.1	11.1	0.0	70.4	
YEAR OF ARRIVAL IN ITALY						
<1997	0.0	26.3	31.6	10.5	31.6	0.090
1997-99	0.0	14.3	42.9	10.7	42.9	
2000-02	4.9	12.2	48.8	8.5	48.8	
2003-05	2.9	7.0	64.0	7.0	64.0	
OCCUPATION						
Yes	1.6	8.5	20.9	7.8	61.2	0.323
No	3.8	11.9	26.0	8.7	49.7	

Row percentages for all variables are shown. See table 1.

As the minimum vaccination coverage required to stop virus transmission is 80-85% [18], this data underline the necessity to maintain high vaccination coverage in Europe. Nevertheless, the immigrants coming from the least developed countries have acceptable coverage toward Poliovirus. This could be explained with the fact that mass vaccinations for Poliovirus are vastly promoted by World Health Organization (WHO) in developing countries.

In regards to rubella, the young age of unprotected women exposes them to a high risk of congenital rubella. Their long stay in Italy confirms the lack of information

about rubella vaccination availability. However, similar data has been previously reported in Italian population. An investigation carried out in 1996 shows that 10% of Italian women aged 15-19 years old and 7% aged 20-39 years old are unprotected with highest rates in Southern Italy [20]. An extraordinary vaccination campaign is on going to decrease the congenital rubella incidence to less than 1:100.000 born alive [20]. After the rubella outbreak of the years 2002-2003, in 2006 the lowest number of cases was reported (257), while in 2008 there was a large outbreak with more than 5,000 cases reported to the compulsory notification system. In the same year 65 cases of suspected rubella in pregnancy were reported including 54 confirmed and 13 confirmed cases of congenital rubella or cases of infection. Moreover 16 voluntary interruptions of pregnancy were recorded.

Regarding hepatitis B our findings on healthy carriers are in line with the literature. Data from China, South East Asia, Africa, Pacific Islands, some areas of Middle East and Amazonian basin report rates of 8-15% of healthy carriers, with over 60% of infection risk [21]. In Italy the prevalence of HbsAg chronic carriers was 6% and more, before the vaccine advent, especially in some central and southern regions and metropolitan areas. As far as concern with Italian adults, the vaccinated ones belong to occupational categories at risk. Furthermore, ten years after the routine HBV vaccine introduction in childhood, coverage is generally greater than 90-95% in many areas of Italy, complying with the success of the epidemiological impact of universal immunization.

The preventive value of our study is twofold: to give information about the importance of compulsory vaccination and to facilitate immigrant's access to NHS both for diagnosis services and vaccinations. The diseases studied and the methods used are innovative, because our investigation is not carried out in emergency and differs from other serum-epidemiological surveys performed in particular conditions [22] of social-economic degradation [23].

Immigrants bring with them a variety of cultures and a different perception of health and illness, as they belong to a variety of social and legal status.

CONCLUSION

Our investigation underlines some critical points for immigrant's health even if, from a Public Health perspective, migrant's health unexpressed needs are not so far from Italian people ones. A thorough knowledge of vaccine availability and advantages are necessary to reduce disease risk: therefore, in the new integrated communities sustainable immunization programmes should be carried out to control communicable diseases with an integrated approach of health promotion, prevention and care.

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