

## Socio-demographic Determinants of Rubella Vaccine Uptake by Egyptian University Students Attended a Catch-up Vaccination Campaign

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**Abstract:** Rubella immunization of susceptible persons is the best strategy to prevent all cases of congenital rubella syndrome. In November-December 2008, university students were included -for the first time in Egypt - in a mass campaign for measles-rubella vaccination. However, their rate of vaccine uptake and its determinants were not explored enough. So, a cross sectional study was conducted to compare the university students' vaccine uptake by their socio-demographic characteristics and their knowledge and to identify motivating and de-motivating factors. Findings revealed vaccine uptake by 64.8% of the sample; significantly higher among younger students, who heard about the campaign and who knew its aim. Among the total sample, a high level of awareness was found in knowledge about rubella name, its hazards, suitable age for vaccination and hearing about the campaign while lower awareness level was found in knowing susceptible groups and campaign's aim. Being from a governorate other than that of the university is the significant factor for low hearing about the campaign while being a female and being an urban resident were the significant factors for low knowledge of the campaign's aim. Reported motivating factors for compliance were; knowing rubella hazards and the national aim and encouragement by family & friends while de-motivating factors were insufficiency of information, lack of trust in government and previous vaccination. In conclusion, rubella vaccine uptake by university students can be increased by more advertisement especially among older, female, urban and from other governorates students in addition to trust building and motivation.

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### 1. Introduction:

Maternal rubella infection in the first 8 to 10 weeks of pregnancy results in fetal death or congenital rubella syndrome in up to 90% of the affected pregnancies resulting in 14% of total fetal anomalies (Eason et al., 2001). Congenital rubella syndrome (CRS) is a major cause of handicapping among children in developing countries as it entails multiple defects including deafness, cataract, cardiac anomalies, microcephaly, mental retardation, bone alterations and liver & spleen damage (CDC, 2006).

Prevention remains the best strategy to eliminate all cases of congenital rubella syndrome (CRS) as there is no in-utero treatment available for infected fetuses (Dontigny et al., 2008). Vaccination stops the circulation of rubella virus in the community when sufficiently high uptake is insured by children and adults of both sexes. Otherwise susceptible pregnant women continue to be at risk of rubella infection (Australian national health and medical research council, 2008).

To accomplish the World Health Organization target of reducing congenital rubella syndrome to less than 1/100,000 live births by the year (2010), mass rubella vaccination was used in Latin America, Caribbean and many developing countries (Reef, 2006). Spain combined vaccination campaigns for women in childbearing age with an excellent MMR vaccine (Measles/Mumps/Rubella)

coverage in children (Sanz & De Ory, 2006). In Costa Rica, in addition to high coverage in children, a national immunization campaign targeting both men and women was followed by postpartum vaccination of women who had been pregnant when the campaign was held (Morice et al., 2009).

A susceptibility study involved Egyptian reproductive age women in (2005) concluded that the previous Egyptian policy against rubella had left 16.4% of reproductive age women reached this age with susceptibility to acquire rubella infection with risk of CRS. The susceptibility reached 25.7% in age group (15-25) years (Abou El-Fateh et al., 2006).

Egypt had an epidemic of rubella in (2007) with 11.4 thousand cases of students and adults denoting that supplementary immunization activities (SIAs) were highly indicated. So, a catch up vaccination campaign with rubella-containing vaccine was implemented using (MR)( Measles/Rubella) vaccine in November / December (2008) targeting males and females in the age group (10-20) years (MOHP, 2008).

This was the first Egyptian vaccination campaign that included university students. Reports of MOHP reported that more than 18.3 million adolescents were vaccinated during the campaign with vaccination coverage rate of 96-99% (MOH, 2009) while a research assessed the vaccine uptake among one Egyptian university medical students

reported a much less percent (64.8%); 81.5% among females and 52.1% among males (Abd Elaziz et al., 2010). Vaccination decisions by university students during a vaccination campaign depends on their perception of risks/benefits of the vaccine which varies considerably by different variables (Hamilton-West, 2006).

So, this study aim was to study the uptake of MR vaccine among a university students sample including medical and non medical students and to illustrate the variation of vaccine uptake by some socio-demographic variables and level of knowledge as well as to identify motivating and de-motivating factors.

## 2. Subjects and Methods:

### Study design and population:

A cross sectional study was carried out on a sample of university students in Egypt in the start of (2010). A systematic random sampling technique was used at each entrance of the selected university. The required sample size was calculated to be 128 students using (EPI-INFO version 6 software). Students from all faculties were allowed to be included and the only requirement was being joined to the university during the (2008) measles-rubella vaccination campaign.

### Ethical Issues:

The study proposal and instrument were approved by the institution's review board and voluntary informed oral consents were got from all students enrolled in the study and the identity of the students remained anonymous.

### Data Collection and Scoring:

Data collection process was done by a trained collector using a self-administered questionnaire distributed during a short standardized interview to collect socio-demographic data regarding (age, gender, residence, faculty of study and government of residence). The second part of the questionnaire measured the most relevant knowledge for compliance including (hearing about rubella, knowing its hazards, susceptible groups to infection, appropriate age for vaccination, hearing about the campaign and knowing its aim). The rest of the questionnaire collect data about vaccine uptake in the campaign and motivating factors among compliant students and de-motivating factors among non-compliant students and their eagerness to comply if another campaign is held. In addition, inquiry of all participants about their willingness to know their sero-susceptibility and their acceptance to give blood sample for this purpose.

Calculation of the total knowledge score was performed for each student. Dichotomous questions

and questions with one correct choice were scored as "1" for "Yes or the correct choice" and "zero" for "No or wrong choice" while for questions with more than one correct choice, the participant got one score for each correct choice. Then a total score out of 12 was calculated and the Mean  $\pm$  Standard deviation for knowledge score was computed. For questions with more than one choice, score equal or above the median was considered "Good" while less than the median was "Bad".

### Statistical Analysis:

Data analysis was done using a data base software programs SPSS 10.0 (Statistical package for social science). Analysis included univariate, bivariate and multivariate analytical techniques. Independent variables were analyzed descriptively by frequency distribution and mean  $\pm$  standard deviation (whenever possible). Chi square and Fisher's exact test were used to test the significance of qualitative variables as appropriate while independent samples T-test was used to compare means. Binominal logistic regression was done for significant items to find the predictors of vaccine uptake. The significant knowledge predictors of compliance to vaccination were again compared by different socio-demographic characteristics for more exploration of indicators of non uptake of the vaccine. The level of significance was considered at ( $P < 0.05$ ).

### 3. Results:

As shown in Table (1), about one half of the included students were between 16-18 years of age during the campaign while the other half were of 18-20 years. Females represented more than two-thirds and about 60% of the included students were urban residents. Students studying medical studies (faculties of medicine, pharmacy and nursing) were 48% while non-medical students (faculties of literature, commerce, law, education and production efficiency) were 52%. Approximately 15% of participants were from governorates other than the governorate of their university.

Table (1) also illustrates vaccine uptake by 64.8% of the sample; significantly higher ( $p < 0.05$ ) among younger students compared to older (78% versus 57%). Vaccine uptake was more among rural residents, females, students from the same governorate of their university and surprisingly non medical students than medical (73% versus 57%) but these differences didn't reach statistical significance.

High level of knowledge (Table 2) among the total sample whether vaccinated or unvaccinated was found in knowledge about rubella disease name (97%), its hazards (77%), suitable age for vaccination (86%) and hearing about the campaign (85%) while lower awareness level was found regarding

knowledge about susceptible groups to infection (49%) and campaign's aim (48%). On comparing knowledge of vaccinated versus unvaccinated, hearing about the campaign and knowing its aim were significantly higher among vaccinated ( $p < 0.001$ ) and so does the mean of total knowledge score ( $p < 0.05$ ).

It is important to mention that the mean knowledge score didn't significantly differ between medical and non-medical students in this study and so does the individual items of knowledge except knowledge about rubella hazards which was significantly higher among medical students. Among medical students, compliant students had a significantly higher mean knowledge score than non-compliant medical students. Mean scores were  $(7.5 \pm 2$  versus  $6.1 \pm 2.6$ ) respectively ( $p < 0.05$ ).

In logistic regression analysis for significant risk factors for vaccine uptake (Table 3), all of these factors (hearing about the campaign, knowing its aim and students' age) remained significant ( $p < 0.05$ ).

Exploration of the effect of socio-demographic factors on hearing about the campaign

revealed that being from the same governorate of the university is the only significant factor associated with higher awareness (Table 4). Being a male and being from a rural area were the significant factors for higher awareness of the campaign aim (Table 5).

Motivating factors for vaccination mentioned by compliant students were knowing rubella hazards, knowing national aim of the campaign and encouragement by family & friends. De-motivating factors among non-compliant students were insufficiency of knowledge provided during the campaign, lack of trust in the government and previous vaccination (Table 6).

On exploring the attitude of unvaccinated students towards rubella vaccine uptake- if another campaign is held- 55.6% of them showed a positive attitude. Attitude of total student sample towards knowing their susceptibility status was positive among 67.2% (69.9% among vaccinated and 62.2% among non-vaccinated), however, their acceptance to give blood sample for this purpose was very low (10.0%) as they wanted an easier and more convenient method.

**Table (1) Socio-demographic Characteristics of included university students sample by their vaccination state**

Variables	Vaccinated		Unvaccinated		Total sample characters %	$\chi^2$	P value
	N	%	N	%			
<b>Age at campaign:</b> 16-18-	46	78.0	13	22.0	51.3	5.71	0.02*
	32	57.1	24	42.9	48.7		
<b>Gender:</b> Male	23	57.5	17	42.5	31.5	1.28	0.26
Female	59	67.8	28	32.2	68.5		
<b>Residence:</b> Urban	46	63.9	26	36.1	59.5	0.39	0.53
Rural	34	69.4	15	30.6	40.5		
<b>Faculty:</b> Medical	35	56.5	27	43.5	48.4	3.72	0.054
Non-medical	48	72.7	18	27.3	51.6		
<b>Government:</b> Same	74	67.9	35	32.1	85.2	2.99	0.08
Other	9	47.4	10	52.6	14.8		
<b>Total</b>	83	64.8	45	35.2	100.0		

\*Statistically significant

**Table (2) Comparing vaccinated versus non-vaccinated students by their knowledge**

Variables	Vaccinated		Unvaccinated		Total %	$\chi^2$	P value
	N	%	N	%			
<b>Know Rubella name:</b> Yes	81	97.6	43	95.6	96.9	0.4	0.53
No	2	2.4	2	4.4	3.1		
<b>Know Rubella hazards:</b> Correct	61	73.5	37	82.2	76.6	1.24	0.27
Wrong	22	26.5	8	17.8	23.4		
<b>Know Susceptible groups:</b> Good	41	49.4	22	48.9	49.2	0.01	0.96
Bad	42	50.6	23	51.1	50.8		
<b>Know Suitable age :</b> Good	75	90.4	35	77.8	85.9	3.82	0.051
Bad	8	9.6	10	22.2	14.1		
<b>Hear about campaign:</b> Yes	81	97.6	28	62.2	85.2	28.9	0.000*
No	2	2.4	17	37.8	14.8		
<b>Know Campaign aim:</b> Correct	50	60.2	12	26.7	48.4	13.2	0.000*
Wrong	33	39.8	33	73.3	51.6		
<b>Total</b>	83	64.8	45	35.2	100.0		
<b>Total knowledge score**</b> Mean $\pm$ SD	7.58 $\pm$ 2.33		6.44 $\pm$ 2.62			T = 2.5	0.01*

\*Statistically significant \*\* Mean score % = 63.2% among vaccinated and 53.7% among no vaccinated

**Table (3): Logistic regression analysis of significant factors affecting compliance to vaccination among participants (N=128)**

Independent variables	B± S.E	Wald	P
Hear about campaign	2.89 ±0.85	11.67	0.001*
Know campaign aim	1.06 ± 0.47	5.06	0.025*
Age group	0.97 ± 0.48	4.14	0.042*
Constant	0.78 ± 1.04	0.56	0.455

\*Statistically significant

**Table (4): Comparing socio-demographic Characters of students heard about the campaign versus who didn't hear about it**

Variables	Heard about campaign		Didn't Hear about campaign		$\chi^2$	P value
	N	%	N	%		
<b>Age at campaign:</b> 16-18-	53	89.8	6	10.2	0.88	0.348
	47	83.9	9	16.1		
<b>Gender:</b> Male	33	82.5	7	17.5	0.296	0.586
Female	75	86.2	12	13.8		
<b>Residence:</b> Urban	60	83.3	12	16.7	0.45	0.502
Rural	43	87.8	6	12.2		
<b>Faculty:</b> Medical	49	79.0	13	21.0	3.57	0.059
Non-medical	60	90.9	6	9.1		
<b>Government:</b> Same	97	89.0	12	11.0	Fisher's exact test	0.009*
Other	12	63.2	7	36.8		
<b>Total</b>	109	85.2	19	14.8		

\*Statistically significant

**Table (5): Comparing socio-demographic Characters of students knew the campaign aim versus who didn't know it**

Variables	Knew campaign aim		Didn't Know campaign aim		$\chi^2$	P value
	N	%	N	%		
<b>Age at campaign:</b> 16-18-	34	57.6	25	42.4	1.44	0.23
	26	46.4	30	53.6		
<b>Gender:</b> Male	25	62.5	15	37.5	4.374	0.036*
Female	37	42.5	50	57.5		
<b>Residence:</b> Urban	29	40.3	43	59.7	6.61	0.013*
Rural	31	63.3	18	36.7		
<b>Faculty:</b> Medical	26	41.9	36	58.1	2.04	0.15
Non-medical	36	54.5	30	45.5		
<b>Government:</b> Same	54	49.5	55	50.5	0.358	0.55
Other	8	42.1	11	57.9		
<b>Total</b>	62	48.4	66	51.6		

\*Statistically significant

**Table (6): Motivating factors among vaccinated students (N= 83) and De-motivating factors among unvaccinated students (N= 45)**

Motivating factors among vaccinated students		De-motivating factors among unvaccinated students	
Factor	%	Factor	%
Knowing rubella hazards	50.0	Insufficiency of Knowledge	48.6
Knowing national aim	29.4	Lack of trust in government	43.2
Encouragement by family & friends	20.6	Previous vaccination	8.1
<b>Total</b>	100.0	<b>Total</b>	100.0

#### 4. Discussion:

Routine infant rubella vaccination without high vaccination coverage can lead to a paradoxical increase in susceptibility of women with a risk of increasing occurrence of congenital rubella. This phenomenon occurred in Greece during the 1980s (Gioula et al., 2007). Many Studies stressed on the age shift of rubella infection to young adults where

adults above 15 years account for 70% of the cases of rubella in developed countries (Banerjee et al, 2007).

For progress towards elimination of rubella and congenital rubella syndrome in the Americas, they introduced rubella-containing vaccine (RCV) into routine vaccination programs of all countries for children aged 12 months and reach  $\geq 95\%$  coverage in all municipalities. Also, they conducted a one-time mass campaign among adolescents and adults and

periodic follow-up campaigns among children aged <5 years (CDC, 2008).

In Egypt, the previous policy didn't start the inclusion of rubella vaccine in the compulsory childhood vaccination until (1997) births when it was introduced in the form of MMR at 18 months (WHO, 2002). That policy has left 16.4% of women reached the reproductive age with susceptibility to acquire rubella (Abou El-Fateh et al., 2006).

Rubella epidemic in (2007) in Egypt rationalized changing the compulsory vaccination schedule since August (2008) to include MMR at 12 months and 18 months instead of measles at 9 months & MMR at 18 months (MOH, 2008). Also, this epidemic rationalized the vaccination campaign for rubella which was implemented in the period from 16th of November to 4th of December (2008) targeting more than 18.4 million persons aged 10-20 years with availability of 21.5 million doses of MR vaccine to enhance population immunity to rubella and strengthen measles eradication. New national strategy aims at rubella elimination (one case/million) by 2012 and rubella eradication (No cases or virus) by 2015 (MOH, 2009). The MR vaccine was used in similar campaigns in other countries as Iran, Brazil and Costa Rica (Hamkar et al., 2006 & CDC, 2008).

The age group (10-20 years) was chosen for their susceptibility as they were borne before inclusion of rubella vaccine in the compulsory childhood vaccination. Also, highest susceptibility among Egyptian women was found in age group 15-25 years (25.7%) compared to (10.1%) in 26-35 years and (3.1%) in 36-45 years (Abou El-Fateh et al., 2006). In another Egyptian study which found 9.7% seronegativity among females, the highest proportion of susceptible females was in the ages between 6 and 25 years (Hashem et al., 2010). It was also found that the incidence of cases during epidemics in other countries as Brazil was fourfold among individuals aged 14-19 years compared to children aged 1-13 years (Lanzieri et al., 2007).

Both sexes were covered by vaccination to protect females who are near their reproductive age or in its early stage from exposure and to stop the circulation of the rubella virus by minimizing the number of susceptible persons whether males or females (MOHP, 2008). Inclusion of both sexes was also done in Iranian mass campaign in 2003 (Soleimanjahi et al., 2005) and resulted in immunity of 97.5% of susceptible population (Hamkar et al., 2006). When males are not included in vaccination campaigns, they can trigger rubella outbreaks as previously occurred in Argentina, Brazil, and Chile in (2007) (CDC, 2008).

Our study to assess the vaccine uptake and its determinants included students from both genders,

different faculties and different residents. Results revealed vaccine uptake by 64.8% of the sample. This equals what was previously found among medical students of another Egyptian university during the same campaign (Abd Elaziz et al., 2010). However, in the present study the vaccine compliance by medical students was 57% while among non-medical was 73%. The lower compliance rate among medical students denotes a big defect in mobilizing the medical community to support this campaign in which students of medical studies were supposed to play an active role in the campaign (Okamoto, 2008). The compliance rate with MR vaccination of (64.8%) is lower than in Costa Rica where coverage in the MR campaign targeting persons aged 15-39 reached 95% (Morice et al., 2009).

The significantly higher vaccine uptake among younger students compared to older found in the present study was also found in the previous Egyptian study (Abd Elaziz et al., 2010). Younger students in the start of their university years may be more responsive to different invitations inside the university considering them as a part of their new experience of university life.

More vaccine uptake among females versus males without reaching the significance limit lies midway between results of two studies where the first revealed no gender difference in compliance (Majdzadeh et al., 2008) and the other showed significantly more female compliance than males (Abd Elaziz et al., 2010). Our obtained results denotes that both genders were in need for better awareness with the campaign aim to be more interested in prevention of rubella health hazards which endanger the expected kids.

More vaccine uptake by rural residents can be contributed to their significantly higher awareness of campaign's aim compared to urban residents. This most probably resulted from the more advertising efforts usually done by rural health units before campaigns and the rapid propagation of knowledge in rural communities which are more confined than urban ones. What is worrying is that urban residents in Egypt were found to be more susceptible (Abou El-Fateh et al., 2006). Hence, the more susceptible group was the less compliant.

Hearing about the campaign was significantly influenced by being from a governorate other than that of the university, where the percent of students from other governorates who didn't hear about the campaign was triple that of students of the same governorate. Up to my knowledge, this is the first report of such disadvantage affecting students studying away from their families—at least in Egypt. This should alert the authorities to give special care for this group as previously recommended (El-Sharkawy, 2011).



Non medical students were more compliant than medical. Although this difference didn't reach statistical significance, it gives an idea about the disability of current policy of medical faculties to sufficiently inform students about national health activities and motivate them not only to comply but also to feel responsible and participate in these activities. The previous study among medical students (Abd Elaziz et al., 2010) found that, non-compliant students had a higher mean knowledge score percent than compliant students but the difference was statistically insignificant. So, the knowledge alone are not sufficient to yield good attitude but motivation is required.

Comparing knowledge between medical and non-medical students revealed no significant difference between main score nor between the percent of students having good knowledge except for rubella hazards which wasn't stressed on during the campaign in enough degree while medical students knew it from their study. Disagreeing results were found in the study of Abd Elaziz et al. (2010) who studied the awareness in medical and non medical sample and found that the mean knowledge score about the vaccination was significantly higher among medical students compared to non medical students.

The level of knowledge among our total sample (vaccinated and unvaccinated) was higher than other Egyptian studies. Most students knew rubella disease name, its hazards and the suitable age for vaccination while in the study of Abd Elaziz et al. (2010) only little percent knew the hazards of getting rubella and the suitable age for vaccination. Also, very limited knowledge regarding rubella vaccine and infection among reproductive age females were previously reported by Abou El -Fateh et al. (2006) and Hashem et al. (2010). The posters supplied by the Ministry Of Health to all universities for announcement of the campaign might be more effective in some universities than others according to the places where they were put and the extent to which students were accustomed to the presence of posters around them. Also, the present study was carried out one year after the campaign and among a highly educated group who may got more knowledge after the campaign.

Relatively low awareness of knowledge about susceptible groups to infection and campaign aim found in obtained results agrees with Abd Elaziz et al. (2010) as the rational of the campaign was lacked from the posters.

Significantly higher mean total knowledge score among vaccinated versus unvaccinated and higher percentage of vaccinated students had correct knowledge in all aspects which reached statistical significance in hearing about the campaign and

knowing its aim denotes that generally there is an association between high awareness and vaccine uptake.

Reported motivating factors for compliance highlighted the influence of awareness of rubella hazards and national aim of the campaign on uptake of the vaccine and added the encouragement by family & friends as an important motive. Demotivating factors led to non-compliance of unvaccinated students were insufficiency of knowledge, lack of trust in government and previous vaccination. Similarly, insufficient information, previous vaccination or infection and lack of trust in things for free were of the previously reported reasons for non compliance by Abd Elaziz et al. (2010). Although Wicker et al. (2008) said that students' vaccination histories are not so reliable and students should comply with vaccination campaigns, the non-compliant students showed their false perception of low risk of getting infection, their unconcern besides lack of trust in government which may be referred to the political deterioration at that time. Attitude towards rubella vaccine uptake if another campaign is held was positive among only slightly more than one half of the unvaccinated students which denote that a new campaign has not been rationalized yet and if held in current circumstances, unsatisfactory uptake is expected.

Attitude of all students towards testing their susceptibility status was positive among much less percent than in the study of Abou El -Fateh et al. (2006) where all participants accepted screening for susceptibility as 93.3% of their study participants were married females while among our sample only 2 students were married. Low risk perception and fatalism among university students were previously reported (El-Sharkawy, 2005 and El-Sharkawy, 2011). This is especially higher when they are unmarried and the issue is about risks affecting embryos. Fear of giving a venous blood sample can be solved by ELISA testing of rubella IgG in a dried blood spot sample (Hardelid et al., 2008). Also, conducting opportunistic screening for both partners during premarital counseling and vaccination of the susceptible persons before marriage by enough time may be an appropriate method for seroprevalence survey and for susceptibility detection & management.

This study limitation was to test the awareness one year after the campaign. This gives the long term awareness of the problem not the awareness at campaign time.

## 5. Conclusion:

In conclusion, rubella vaccine uptake by university students can be increased by more announcement of rubella hazards, the campaign and its national aim

using mass media, health centers, different clinics, hospitals and pharmacies with social and medical community mobilization to raise awareness especially among older, urban & from other governorates students with use of positive peer pressure & family support. In addition, building trust in the government and motivation are required. After achieving these points and conducting a cost analysis study, a follow up campaign for 3 days can be done for the same age group or a slightly wider range (10-25 years). Alternatively, rubella susceptibility detection & management during premarital counseling can be used.

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