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ABSTRACT

Introduction: The aim of this study was to investigate knowledge and practices about influenza among patients on dialysis services of Italian hospitals at risk of severe influenza infection and vaccine and to identify predictive factors to vaccination adherence.

Methods: A cross-sectional observational study was carried out from January 2017 to July 2017 after the 2016/2017 influenza vaccination campaign. The questionnaire was administered to all patients treated in seven large Italian dialysis services. It consisted of influenza vaccination coverage, knowledge about influenza and its vaccination, perceived risk of influenza complications, recommendations on influenza uptake received by general practitioner (GP) and nephrologist.

Results: Response rate was 90% (703/781). Patients' knowledge about influenza infection and vaccine were detected by nine closed questions: 35.6% of responders answered correctly to ≥ 6 sentences, 47.5% of them reported that "influenza vaccine can cause influenza" and 45.7% believed that "antibiotics are a correct strategy to treat influenza". Levels of perceived risks of hospitalisation and death were low in 39.3% and 16.5% of patients respectively. The adherence to the last seasonal influenza vaccination was 57.5%. The multivariate predictors of influenza vaccination uptake resulted: age ≥65, male, consulting TV/radio, asking information to GP and/or nephrologist.

Conclusions: The study reveals the low adherence to influenza vaccination and the subotpimal level of knowledge in dialysis patients. Different strategies, including a greater alliance among nephrologists and GPs to prevent influenza should be encouraged to improve the adherence to influenza vaccination in this at risk group.

Introduction

Seasonal influenza is a vaccine-preventable disease that infects approximately ten to thirty per cent of European population each year and causes hundreds of thousands of hospitalisations across Europe.[1] Elderly, children and people with chronic conditions suffer the most, but everyone is at risk of developing serious complications, such as pneumonia, myocarditis and encephalitis, which may result in death.[2-5]

The most efficient mean for preventing a significant number of influenza infections, and the resulting morbidity and mortality, is an annual vaccination.[6] Ever since the first influenza vaccines were developed, the main approach has been to immunise groups at risk rather than whole populations.

In accordance with European Centre for Disease Prevention and Control (ECDC) guidance and the World Health Organization (WHO), at risk groups are elderly (≥65 years) and people of all ages (≥6 months of age) with chronic medical conditions (such as, chronic pulmonary, cardiovascular, renal, hepatic and chronic neurological diseases, haematological/metabolic disorders, immunosuppression due to disease or treatment, HIV/AIDS, children on long-term aspirin therapy, morbid obesity, neuromuscular conditions).[7-9]

In Europe the minimum objective is 75% of influenza vaccine coverage in patients with chronic medical conditions with an optimal target of 95%.[7,10] The most recent collected influenza vaccination coverage ranged from 24.9% to 71.8% (2014–2015) rates among individuals with chronic medical

conditions, as it was reported by nine European Member States. The remaining 23 Member States, including Italy, were not able to report vaccination coverage rates for this group at risk.[7]

Literature has explored knowledge, attitudes and risk perception on influenza infection and its vaccine among healthcare workers (HCWs),[11-14] but there are not studies from the patient's point of view.

In a study Bödeker et al.[15] reported that among the at risk group with underlying chronic diseases, the most commonly stated reasons for not being vaccinated were mistrust for the vaccination (22.3%), perception of low risk for influenza (21.2%), and not having considered influenza immunization yet (14.9%). Besides, 9.7 of these patients did not know that they belonged to the recommended group for seasonal influenza vaccination.[15] A Canadian study found that low perceived susceptibility to influenza or severity of the infection, as well as a lack of interest, time or information[16] are the most common reasons to opt out of influenza vaccination in people aged ≥60 and people with chronic medical conditions.

This study aimed to investigate, through a questionnaire, knowledge and practices about influenza vaccination among patients with chronic renal disease treated at Italian hospital dialysis services. The research tried to identify predictors of seasonal influenza vaccine adherence in this group of patients at higher than average risk of adverse outcome if affected with seasonal influenza.[17,18] A pilot study was conducted by administering the questionnaire to 54 patients in dialysis at the research coordinating hospital to test the understanding of the questions, ease in completing, and the simplicity of the terms.

Results

The response rate was of 90% (703/781), 60.9% of the interviewed patients were ≥65 with a mean age of 67.3 [standard deviation (SD) = 13.8], 63.6% were males, 93% were Italian and 70% had a higher school education. There were no significant statistical differences in the distribution of age, gender, nationality and education level among the patients receiving treatments in the dialysis centres.

The adherence to influenza vaccination in all dialysis centres was of 57.5% (95% CI: 53.8% – 61.1%). The percentage distributions of patients vaccinated against influenza in the last seasonal campaign stratified for the seven Italian hospital centres that participated in the survey were reported in Table 1.

Table 1. Patients vaccinated against influenza in the last seasonal campaign stratified by the 7 Italian hospital centers.

Italian hospital centers	Responders N°	Vaccinated N° (%)
Center 1	138	98 (71.0)
Center 2	145	78 (53.8)
Center 3	80	33 (41.3)
Center 4	98	76 (77.6)
Center 5	83	28 (33.7)
Center 6	77	32 (41.6)
Center 7	82	59 (72.0)
All centers	**703**	**404 (57.5)**

Table 2. Level of patients' knowledge about influenza and influenza vaccination (frequencies of correct sentences are marked in bold) [tot = 703].

	Patients' answers		
	True	False	*Missing*
Sentences administrated to patients	N° (%)	N° (%)	*N° (%)*
Influenza infection is transmitted by droplets	**488 (69.4)**	184 (26.2)	*31 (4.4)*
Stomach influenza and influenza are caused by the same agent	157 (22.3)	**527 (75.0)**	*19 (2.7)*
The agent of influenza is a bacterium	422 (60.0)	**263 (37.4)**	*18 (2.6)*
The influenza vaccine can cause influenza	334 (47.5)	**348 (49.5)**	*21 (3.0)*
Influenza infection can lead to complications	**612 (87.1)**	78 (11.1)	*13 (1.8)*
Influenza in patient with chronic diseases can be more dangerous than in healthy people	**645 (91.7)**	44 (6.3)	*14 (2.0)*
Antibiotics are a correct strategy to treat influenza infection	321 (45.7)	**365 (51.9)**	*17 (2.4)*
Influenza infection is transmitted by insects	177 (25.2)	**507 (72.1)**	*19 (2.7)*
The effectiveness of the vaccine lasts for one season	**564 (80.2)**	121 (17.2)	*18 (2.6)*

Patients' knowledge about influenza and vaccine were studied based on nine closed questions reported in Table 2. Correctly, 92% (645/703) of the patients were aware that "influenza in patient with chronic diseases can be more dangerous than in healthy people", 87% (612/703) that "influenza infection can lead to complications", 80% (564/703) that "the effectiveness of the vaccine lasts for one season", 75% (527/703) that "stomach influenza and influenza are not caused by the same agent", 72% (507/703) that "influenza infection is not transmitted by insects", 69% (488/703) that "influenza infection is transmitted by droplets", 52% (365/703) that "antibiotics are not a correct strategy to treat influenza infection" and only 50% (348/703) that "the influenza vaccine cannot cause influenza". Mistakenly, 60% (422/703) believed that "the agent of influenza is a bacterium".

Table 3 shows the distribution of patients' characteristics and knowledge and perceived risks regarding influenza in all population (tot = 703) and in vaccinated patients (tot = 404). The percentages of patients that got influenza vaccination in the last seasonal campaign were statistically significant higher in the ≥65 years than in the <65 years (69.2% versus 39%), in males than in the females (61.7% versus 49.6%), in Italians than in foreigners (58.9% versus 41.9%) and in primary school educated than in higher school educated (66.2% versus 53.7%). The 64% of patients demonstrated insufficient knowledge about influenza and its vaccination because they answered incorrectly to more than half of the nine questions shown in Table 2. The interviewed patients were aware of being at risk in case of infection of influenza virus, hospitalisation in the 59.2% and death in the 80.9% of cases. The above knowledge and perceived risk of hospitalisation and death did not affect patients to get vaccination in a statistically significant way.

Table 4 reports which people and media, patients consulted on influenza vaccination in sample (tot = 703) and in the vaccinated patients' group (tot = 404). The patients referring they were informed by their GP in most cases (42.7%), followed by nephrologist (30.3%), relatives/friends (6%), other HCWs (5.4%) and other patients (2.1%). Consultation with

Table 3. Respondents' characteristics and knowledge and perceived risks regards to influenza in all sample (tot = 703) and in vaccinated patients (tot = 404).

Variables		All patients N° (%)	Vaccinated %	OR*	95% CI^	p Value
DEMOGRAPHIC CHARACTERISTICS						
AGE	< 65 years	269 (38.3)	39.0	-		<0.001
	≥ 65 years	428 (60.9)	69.2	3.5	2.5–4.8	
	Missing	6 (0.9)				
GENDER	Male	447 (63.6)	61.7	1.6	1.2–2.2	<0.01
	Female	251 (35.7)	49.6	-		
	Missing	5 (0.7)				
NATIONALITY	Italian	654 (93.0)	58.9	2.0	1.1–3.7	<0.05
	Other	43 (6.1)	41.9	-		
	Missing	6 (0.9)				
EDUCATION	Primary school	204 (29.0)	66.2	1.7	1.2–2.4	<0.01
	Over primary	492 (70.0)	53.7	-		
	Missing	7 (1.0)				
KNOWLEDGE AND PERCEIVED RISKS ABOUT INFLUENZA						
Knowledge level of influenza vaccination and influenza	< 6 (scale:0–9)	450 (64.0)	58.9	1.2	0.9–1.6	0.3
	≥ 6 (scale:0–9)	250 (35.6)	54.8	-		
	Missing	3 (0.4)				
Perceived risk level of hospitalization due influenza	< 3 (scale:0–5)	276 (39.3)	60.1	1.2	0.9–1.6	0.3
	≥ 3 (scale:0–5)	416 (59.2)	55.8	-		
	Missing	11 (1.6)				
Perceived risk level of death due influenza	< 3 (scale:0–5)	116 (16.5)	62.1	1.2	0.9–1.7	0.3
	≥ 3 (scale:0–5)	569 (80.9)	56.6	-		
	Missing	18 (2.6)				

*OR: odd ratio
^CI: confidence interval

Table 4. Persons and media consulted by patients on influenza vaccination in all sample (tot = 703) and in vaccinated patients (tot = 404).

Variables		All patients N° (%)	Vaccinated %	OR*	95% CI^	p Value
PERSON ASKED BY PATIENTS FOR INFORMATION ON INFLUENZA VACCINE						
GENERAL PRACTITIONER *(missing: 1)*	Asked	300 (42.7)	73.3	3.3	2.4–4.5	<0.001
	Not asked	402 (57.2)	45.5	-		
NEPHROLOGIST *(missing: 1)*	Asked	213 (30.3)	71.8	2.4	1.7–3.4	<0.001
	Not asked	489 (69.6)	51.1	-		
ANOTHER HEALTH CARE WORKER *(missing: 1)*	Asked	38 (5.4)	65.8	1.5	0.7–2.9	0.3
	Not asked	664 (94.5)	56.9	-		
RELATIVES/ FRIENDS *(missing: 1)*	Asked	42 (6.0)	69.3	1.7	0.9–3.3	0.1
	Not asked	660 (93.9)	56.7	-		
OTHER PATIENTS *(missing: 1)*	Asked	15 (2.1)	80.0	2.3	0.7–7.1	0.2
	Not asked	687 (97.7)	56.9	-		
AT LEAST ONE OF THE ABOVE PERSONS *(missing: 1)*	Asked	401 (57.0)	70.1	3.5	2.6–4.8	<0.001
	Not asked	301 (42.8)	40.5	-		
MEDIA CONSULTED BY PATIENTS ABOUT INFLUENZA VACCINE						
TV/RADIO *(missing: 1)*	Consulted	426 (60.6)	62.7	1.7	1.3–2.3	<0.001
	Not consulted	276 (39.3)	49.3	-		
NEWSPAPERS *(missing: 1)*	Consulted	112 (15.9)	62.5	1.3	0.8–1.9	0.2
	Not consulted	590 (83.9)	56.4	-		
BROCHURE/ POSTERS *(missing: 18)*	Consulted	116 (16.5)	62.1	1.2	0.9–1.7	0.3
	Not consulted	569 (80.9)	56.6	-		
INTERNET *(missing: 1)*	Consulted	86 (12.2)	34.9	-		<0.001
	Not consulted	616 (87.6)	60.6	2.9	1.8–4.6	
SOCIAL NETWORKS *(missing: 1)*	Consulted	21 (3.0)	33.3	-		<0.05
	Not consulted	681 (96.9)	58.1	2.8	1.1–7.4	
RECOMMENDATION FOR INFLUENZA VACCINATION TO PATIENT BY						
GENERAL PRACTITIONER *(missing: 3)*	Provided	419 (59.6)	76.8	8.3	5.9–11.7	<0.001
	Not provided	281 (40.0)	28.5	-		
NEPHROLOGIST *(missing: 3)*	Provided	363 (51.6)	74.7	4.6	3.3–6.3	<0.001
	Not provided	337 (47.9)	38.9	-		
	Provided	501 (71.3)	74.5	17.3	11–27	<0.001
AT LEAST ONE OF THE ABOVE PERSONS *(missing: 3)*	Not provided	199 (28.3)	14.6	-		

*OR: odd ratio
^CI: confidence interval

GP or nephrologist resulted in a statistically significant greater percentage of vaccinated patients respectively by 73.3% and 71.8%. The most used media were TV and radio (60.6%), followed by brochure/posters (16.5%), newspapers (15.9%), Internet (12.2%) and social networks (3%). Consultation of TV/radio resulted in a statistically significant greater percentage of vaccinated patients of 62.7%. The GP and the nephrologist advised patients to get vaccinated respectively 59.6% and 51.6% of cases. The patients who received the recommendation by the GP (76.8%) and by the nephrologist (74.7%) were

Table 5. Multivariate predictors of influenza vaccination adherence among patient in dialysis.

Variables	Logistic regression		Stepwise logistic regression analyses	
	OR*(95% CI^)	p Value	OR (95% CI)	p Value
Age ≥ 65 years	2.9 (2.0–4.2)	<0.001	3.0 (2.1–4.4)	<0.001
Male	1.7 (1.2–2.4)	<0.01	1.7 (1.2–2.4)	<0.01
Italian nationality	0.8 (0.4–1.6)	0.5	-	-
Primary school education	1.3 (0.9–2.0)	0.2	-	-
TV/radio consulted	1.5 (1.0–2.1)	<0.05	1.6 (1.1–2.3)	<0.01
Newspapers consulted	1.4 (0.9–2.1)	0.2	-	-
Internet consulted	0.5 (0.3–0.8)	<0.05	0.5 (0.3–0.8)	<0.01
Social networks consulted	1.0 (0.4–3.1)	0.9		
General practitioners asked by patients	2.5 (1.8–3.7)	<0.001	2.5 (1.8–3.6)	<0.001
Nephrologists asked by patients	2.1 (1.4–3.2)	<0.001	2.2 (1.5-3.3)	<0.001

*OR: odd ratio
^CI: confidence interval

vaccinated in statistically significant percentage greater than those who were not advised by GP (28.5%) and by nephrologist (38.9%).

Table 5 reports the results of the logistic regression and stepwise logistic regression analyses. Independent factors of multivariate analyses with positive impact on administration of influenza vaccination were: age ≥65 (OR = 3.0), male (OR = 1.7), consulting TV/radio (OR = 1.6), asking information to GP (OR = 2.5) or to nephrologist (OR = 2.2).

Discussion

This paper is the first study on a large scale about knowledge and practices regarding the influenza in a specific "influenza vaccination risk group" who are patients on dialysis. Besides, the research tried to identify predictors of seasonal influenza vaccine adherence in this group of patients.

The study reveals the low adherence to influenza vaccination and the suboptimal level of knowledge about influenza infection in the population at higher risk of adverse outcome that can be reduced by influenza vaccination. The global adherence to influenza vaccination in all dialysis centres joining in the study was 57.5%. The percentage was insufficient if we consider that the minimum goal of influenza vaccine coverage in patients with chronic pathologies like dialysis, has been fixed by the Italian National Plan for Vaccine Prevention at 75%, with optimal target of 95%.[10] The rate varied across hospitals with the highest value of 77.6% and a the lowest of 33.7%. The wide range of the values is difficult to explain. There were no differences in the clinical settings that may account for this, or differences in distribution of age, gender, nationality and education level among patients receiving treatments in the dialysis centres that participated in the study.

The first predictive factor for influenza vaccination adherence emerged in the survey were the subjects over 65, in agreement with other studies.[19-21] Most likely, this result is related to the fact that in Italy a national programme, consolidated over the years, recommended the seasonal influenza vaccination to all healthy and not healthy subjects over 65. Therefore, patients in dialysis have to receive influenza vaccine for two reasons; either because they are elderly or a part of a at risk group. On the other hand, young people can only be "engaged" if recognized as being at high risk. To increase the younger population's awareness of being at high risk because of severity of the diseases as well as reinforcing the proactive role of GP and/or nephrologist, they have to strongly suggest vaccination to dialysis patients of all ages which could be the strategy to support the uptake of seasonal influenza vaccines also in the younger patients.

The media that patients consulted about influenza vaccine most are TV/radio. Among all media, TV/radio and newspapers are statistically significant in influencing patients in their decision to vaccinate against influenza. Other studies reported that awareness acquired through the media was one of major predictors of high influenza vaccine uptake in Europe and the USA.[22,23]

An interesting finding that deserves further insights is the role of the Internet in predicting the influenza vaccination uptake: patients who searched information on the Internet about vaccination were vaccinated less. Among the media tools, the Internet seems to be the least reliable to provide correct information on health topics and, in this case, on influenza vaccination. This is an emerging issue to which the medical class is trying to cope with. The last few years have seen a dangerous and often painful surge in the circulation of inaccurate and sometimes false information, in news with sometimes dramatic consequences on the health of the population. Italian state authorities and professional associations have set up websites[24,25] to offer to the population an accessible information, scientifically solid and always transparent.

GPs play a central role in relationship with the nephrologists in the management of influenza disease. Most of patients indicated they obtained information about influenza vaccine from their family GP and not from their nephrologist. The nephrologists may expect the patient's primary care providers to take responsibility of preventive care, while GPs may expect the prescribing nephrologists to take responsibility of preventive care associated with dialysis treatment.[26] A strategy to improve the adherence to influenza vaccination among dialysis patients could be to strengthen the collaboration between GPs and nephrologists via shared electronic task dashboards or other technology-based solutions.

Because of the poor knowledge regarding how influenza infection is transmitted, the agent of influenza, the pharmacological treatment of the influenza disease, the risk of the vaccination to cause influenza, the patients reported to have a high awareness of the risk of hospitalisation and death due to influenza, even if they were not influenced to get the vaccine.

Recommendation for influenza vaccination received by GP or nephrologist has positively influenced patients in getting vaccinated. Previous studies have emphasized the importance of advice from HCWs to strongly influence the decision for influenza vaccination.[27-31] They are a good source of patient information, and should be the focus of prevention efforts. This could include trainings and materials to encourage patients at risk of influenza complications to be vaccinated.

There are some limitations to the interpretation of the study results. Since data was generated by a self-administered questionnaire, they are not necessarily objective and may be different from reality. On the other hand, unvaccinated persons may have been less motivated to participate in this survey[32] and vaccination rates may be overestimated because of this non-response bias. Finally, some participants did not answer all questions, which also limit the accuracy of the data.

In conclusion, this study underlines the important role of GP and nephrologist in obtaining high vaccination coverage of patient in dialysis through their recommendation to get vaccinated. With this perspective the practitioners should be trained about the strategies demonstrated in literature to increase vaccination successfully. These strategies could be counselling during routine visit, patient information materials, reminders to patients (telephone or email) and providers on medical charts.[33]

Methods

The cross-sectional observational study was carried out from January 2017 to July 2017 after the 2016/2017 influenza vaccination campaign. The survey was conducted through interviews based on a questionnaire given to the patients treated in dialysis services of seven Italian hospitals. The sample size of 703 patients is calculated in order to extend the results obtained of sample to the entire Italian population of dialysis patients (about 50.000).

The questionnaire, reported in the Supplement 1, investigated respondents' influenza vaccination coverage, their knowledge on influenza infection and its vaccination, perceived risk of complications, and recommendations received by GP and nephrologist. After obtaining the written consent, the questionnaire was handed to patients during the dialysis session and collected after it was completed. A HCW may help patients to read the forms and fill out the forms.

Data collected from the questionnaires were entered in an Excel spreadsheet and were analysed using the statistical software Stata/IC 13.0, Stata Corp LP, United States. Summery statistics contain the assessment of the sample characteristics and factors associated to influenza vaccination adherence. Bivariate statistics (chi-square test) were used to compare vaccinated and unvaccinated patients regarding the following items: personal characteristics (age, gender, nationality, education), type of media (TV/radio, newspapers, brochure/posters, Internet, social networks), people from whom patients got information (GP, nephrologist, other HCWs, family/friends/colleagues, other patients in dialysis), patients' levels of knowledge about influenza disease and influenza vaccine, perceived risks of hospitalisation and death due to influenza,

and physicians (GP or nephrologist). Statistical significance was defined as $p \leq 0.05$.

Because some variables could have been confounding factors in comparison to the others, multivariate logistic regression model was used to adjust the odds ratios, taking into account all the included variables. To this purpose, in the model, all the variables with results associated with the outcome variable of the univariate analysis were included. Variables with a p-value ≤ 0.05 in the univariate analysis were entered in the first step of the multivariable analyses. Therefore, non-significant factors (>0.1) were removed from the model in a stepwise backward procedure to obtain the final model. The variables that did not maintain association in the final model were considered not associated after correction by confounding factors.[34]

This study protocol was approved by the Regional Ethical Committee in the session of March 28, 2017.

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