The Analysis of User Perception and Attitude Using SNS Data about Emergency Contraceptive Pills

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ABSTRACT

In order to ensure the right of self-determination of women, most of countries allow women to buy post-coital contraceptive pills or general medical supplies with ease. This study aims to analyze how ordinary people recognize and respond to post-coital contraceptive pills through collecting atypical data by using the keyword 'Contraception', rather than using the existing actual condition survey, such as questionnaire and interview, so that the results have been presented, which may be referred to for establishment of policies.

☞ keyword : Healthcare, Big Data, Text Mining, Data Mining, Emergency Contraceptive

1. Introduction

Today, the use of post-coital contraceptive pills has been increasing sharply as the restrictions on sales of such drugs are being abolished all over the world. In the case of the United States (U.S.), it is allowed to sell post-coital contraceptive pills without age limits and prescriptions owing to clinching the argument on 'Self-determination of Women (Hangyeore Daily, 2013) And in France, the post-coital contraceptive pills have been classified into the category of non-prescription medicine since a longtime ago, so that students may acquire the drugs without age limits and prescriptions from a infirmary at middle and high schools where a nurse is hired. (Choi, Seon-suk, 2000) Unlike the foreign countries, where it is available for people to use post-coital contraceptive pills with ease as those drugs are classified into non-prescription medicine, the Korean government has classified those drugs into prescription-based medicine. So, people may purchase those drugs only when they have got a prescription from a doctor. Globally, there are a total of four countries where the post-coital contraceptive pills are classified into prescription-based medicine, such as Germany, Japan, Italy and Korea. (The

Herald Business, 2012)

According to the announcement in 'Reclassification Scheme for Medicine and Medical Supplies and Future Promotion Plan'announced by the Korea Food & Drug Administration in June 2012, the Korean government made an attempt to switch the status of post-coital contraceptive pills from prescription medicines to non-prescription ones. However, there were substantial concerns surrounding this issue. People would be able to purchase different kinds of post-coital contraceptive pills at any drug stores without prescription if they classified as non-prescribed drugs, which may lead to abuse or misuse of these medicines particularly among adolescent. In order to prevent this problem, the government tried to put an age limit on buying these pills in pharmacy. Nevertheless, the plan foundered and the post-coital contraceptives continue to remain as prescription drugs.

Accordingly, this study aims to identify the characteristics of users by analyzing the unstructured data such as ordinary people's level of awareness of post-coital contraceptive pills, purchase preferences and purchase methods, overall contents of questions, including articles posted on the Internet bulletin boards, in various ways.

It was not easy to carry out a precise actual condition survey with the blatant theme on 'Contraception'as Korea belongs to a cultural zone that traditionally has had a strict attitude toward sex, so that this study was carried out by adopting the Big Data Analysis Method. However, in the cyber culture where anonymity is guaranteed, frank individual opinions can be

reflected, so that the ordinary people's awareness and use of post-coital contraceptive pills could be evaluated through the method.

2. Theoretical background

2.1 Big data analysis

With the technological development of data storage and processing, there has been an explosive increase in the amount of accumulated data for the last couple of years. Among those data, the atypical data of which theform is not fixed yet has become important competitiveness for both individuals and companies. The atypical data include the texts, images, and videos, which are mainly created and accumulated through social media. Regarding the dealing with atypical data, the method, in which the information is derived from text data formed in natural language and the data is dealt with in an effective manner, is called the text mining. And it is the most frequently used method and regarded as the most typical methodology.(An, Tae-seong, 2004; Moon Ju-yeong, 2009; Mooney, 2005) Regarding the more specific definition of text mining, we may refer to Kao and Poteet(2007), who argue that the text mining is to discover and derive uninteresting and non-usual knowledge from free style or non-structured texts. Jeon Chae-nam (2013) defines the text mining as the implementation of frequency analysis through purification of atypical text data and extraction of useful words, so that we may assume that the text mining is limited to the contents related to technology to process natural language and analyze morphemes. Jeong Geun-ha(2010) argues that users are mainly interested in finding the meaning on the level of context rather than the information on the level of keywords, and he defines such a process as the text mining.

In this study, the users' awareness on prescription-based medicine has been analyzed by using the text mining techniques.

2.2 Analysis on social networks

The tasks for studies on social network analysis include the traditional studies, such as group structure analysis where relationships among people are analyzed, and the knowledge structure analysis that is implemented to derive potential technologies and research fields, and the sensitivity analysis which enables us to identify the trend, reputation and awareness through online social data. (Bae, Sang-tae, 2014) Since the start of 2000s, when carrying out a social network analysis, the range of nodes related to investigation of relationships has extended from 'People' to 'Data', and we may find out the reason from the phenomenon in which the movement to information society is being accelerated and a huge amount of knowledge is spread out through online. (Jeong Ji-eun, 2012) The potential usefulness of social networkanalysis has been paid more attention to as it interlocked with the era of Big Data. In this study, the morpheme keywords derived through natural language processing are established as each node, and the analysis of keyword social network was carried out by establishing the relationships among keywords mentioned together in a document.

2.3 Post-coital contraceptive pills

The post-coital contraceptive pills are also called Emergency contraception pills (Cha, Hee-je, 2012), and it is for an oral contraception that prevents ovulation, insemination and implantation as a different concept of approach method from an artificial termination of pregnancy. (Park, Sang-hwa, 2002) In case of failure in the existing way of contraception, or when there is a strong possibility to be pregnant due to an unavoidable sexual intercourse, the woman can prevent the unwanted pregnancy by using the hormone treatment through taking the pills within 72 hours after the sexual intercourse. (Jo, Chang-ik, 2013; Zuppann, 2011) The reason why the woman has to take the pills within 72 hours (3 days) is that the ovulated egg moves through the Fallopian tube after it is inseminated with sperm in meeting with semen and insemination, and it arrives at the uterus in 72 hours.

So, the contraception effect will increase when the woman takes the pill as soon as possible as the pill prevents the implantation of fertilized egg in the uterus. (Gu In-hwoi, 2012) According to the existing studies, we may know that the use of post-coital contraceptive pills is regarded as an alternative to the contraception method taken before sexual intercourse. (Calabretto, 2009; miller, 2011; rocca et al., 2007) If a woman has failed in contraception, she has to take post-coital

contraceptive pills as soon as possible to avoid an unwanted pregnancy. However, currently Koreans have severely limited access to those medicines because post-coital contraceptive pills are classified into the prescription-based medicines, which are strictly distinguished from general medicines. The percentage of women who take oral birth-control pills is 2.8%, and the percentage of women who take post-coital contraceptive pills is 5.6%, so that the percentages may be considered to be much lower than those of other foreign countries. However, the proportion of artificial termination of pregnancy is similar to those of other countries, or rather higher than those of European countries such as Germany, Italy and so on. (Kim, Dong-sik, 2012) The results of existing studies put emphasis on the useof post-coital contraceptive pills, which is regarded as the most effective method to avoid an unwanted pregnancy. (Lee, 2002) In this study, the actual intention to use post-coital contraceptive pills was analyzed by reviewing the personal writing and answers posted on the Internet in order to avoid result errors caused by respondents due to the existing method of questionnaires and interviews.

3. Analysis results

3.1 Data collection

In order to analyze the text data that were posted on the Internet voluntarily, the data selected in this study should include the keyword 'Contraception'. A total of 7,921articles were collected as the data, which had been posted during the period between 2009 and 2014. The data was collected from the SNS, Naver, Daum, Media Daum and Tistory by using a web-crawling method. The data consisted of 2 cases for SNS, 6,587 cases from Naver bulletin board, 263 cases from Naver blog, 954 cases from Naver café, 38 cases from Daum blog, and 77 cases from Daum café.

3.2 Data purification

A total of 7,921cases of data were collected at the first web-crawling, and after data purification, a total of 7,881cases of data were selected as the objects of analysis.

Duringthe purification process, the data which contained advertisement, notice, quotation, special characters, and false rumor, including the data with spacing errors were deleted.

The analysis on morphemes centered on the nouns in the 7,881 cases of purified data resulted in the extraction of 27,991,392 noun keywords in total. And also, among 7,881 articles, there were 4,483 articles in which post-coital contraception was mentioned, so those articles accounted for 56.9% of the total number. In addition, there were 762 articles written by minors, which accounted for 9.7% of the total number.

3.3 Results of exposure of contraception-related major keywords

Regarding the exposure of major keywords, we may see that the similar nouns are distributed over the high rank every year as a whole. The keywords such as menstruation, pregnancy, dose, sexual relationship, and birth-control pills had the high percentage. And the year 2012 show unusual phenomenon with keywords such as wife and marriage.
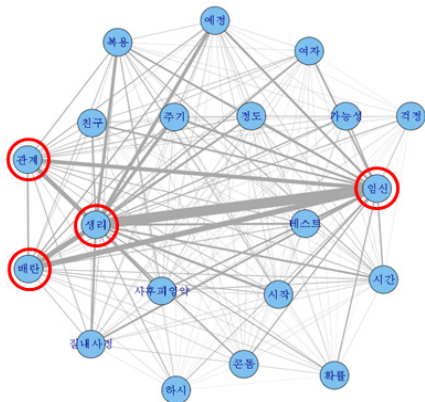
(Table 1) Trend analysis on total data in each year

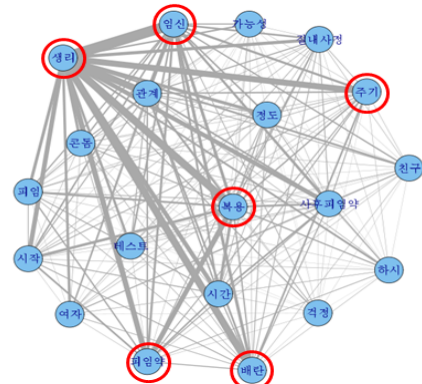| 2009	2010	2011	2012	2013	2014
Keywords (%)	Keywords (%)	Keywords (%)	Keywords (%)	Keywords (%)	Keywords (%)
Menstruation (18.9%)	Menstruation (19.4%)	Menstruation (16.8%)	Menstruation (14.0%)	Menstruation (15.2%)	Pregnancy (14.6%)
Pregnancy (13.2%)	Pregnancy (10.3%)	Taking pills (11.2%)	Taking pills (12.3%)	Pregnancy(12.1%)	Taking pills (10.6%)
Relationship (7.3%)	Taking pills (7.8%)	Pregnancy (9.6%)	Pregnancy (9.3%)	Taking pills (10.0%)	Menstruation (9.5%)
Ovulation (6.1%)	Relationship (6.5%)	Birth-control pills (7.3%)	Birth-control pills (8.7%)	Ejaculation inside vagina (7.5%)	Birth-control pills (6.9%)
Taking pills (5.3%)	Birth-control pills (5.5%)	Relationship (6.3%)	Ejaculation inside vagina (6.4%)	Birth-control pills (7.1%)	Relationship (5.6%)
Post-coital contraceptive pills (4.4%)	Post-coital contraceptive pills (5.1%)	Ejaculation inside vagina (5.6%)	Relationship (5.0%)	Relationship (6.8%)	Post-coital contraceptive pills (5.2%)

3.4 Linkage analysis on contraception-related keywords

This analysis was carried out through the UCINET which is known as the software for social network analysis.
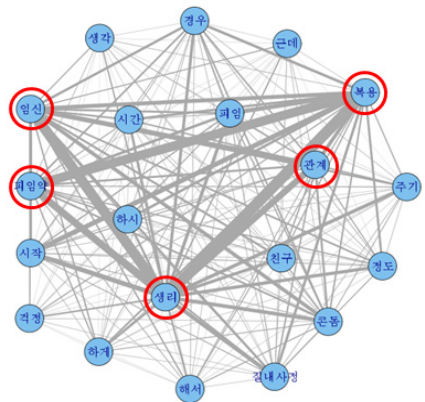
After establishing each keyword as a node, the visualization analysis was carried out with the network data in which the relationship among keywords appearing in a document identically was expressed by connecting them with lines.

(Fig. 1) Linkageanalysis on keywords obtained in 2009

(Fig. 2) Linkage analysis on keywords obtained in 2010

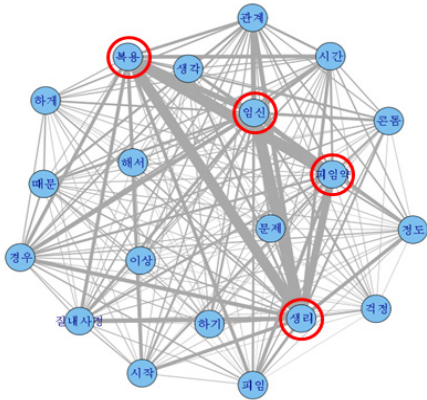(Fig. 3) Linkage analysis on keywords obtained in 2011

The thickness of lines between each keyword was adjusted according to the same frequency of appearance in the same document. The top 20 search keywords in terms of frequency were subject to the analysis, and the results of visualization were divided by years, and organized as follows. Firstly, (Fig. 1) is the visualization result of the data obtained in 2009, and it shows that there is a high frequency of appearance of the same documents regarding the relationship between menstruation and pregnancy, menstruation and ovulation, including menstruation and sexual relationship.

(Fig. 2) is the visualization result of the data obtained in 2010, and it shows that there is a high frequency of appearance of the same document regarding the relationship between
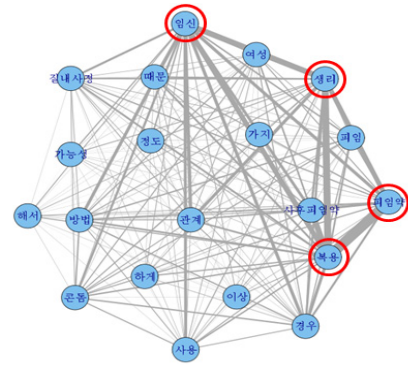
menstruation and pregnancy, menstruation and menstrual cycle, menstruation and taking pills, menstruation and ovulation, including menstruation and birth-control pills. Unlike the year 2009, the relationship between birth-control pills and taking those pills appeared to be new in 2010. It may be assumed that the users stated to take birth-control pills as a contraception method, or their interest in the administration method in advance as they selected birth-control pills as a contraception method, in comparison with the year 2009.

In the year 2011, as shown in (Fig. 3), we may know that there is a high frequency of appearance of the same documents regarding the relationship between menstruation and pregnancy, menstruation and taking pills, menstruation and birth-control pills, including menstruation and sexual relationship. On the basis of birth-control pills, we may confirm that there is a high frequency of appearance of same document regarding the relationship between birth-control pills and taking pills, including birth-control pills and menstruation.
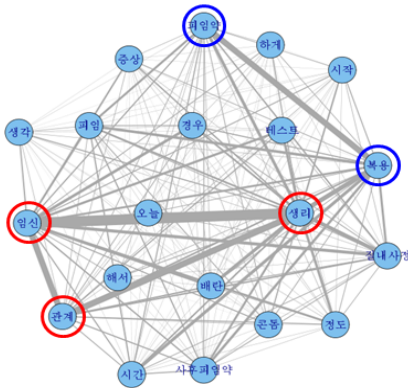
In the year 2011, as shown in (Fig. 4), we have confirmed that there is a high frequency of appearance of the same document regarding the relationship between taking pills and pregnancy, taking pills and birth-control pills, including birth-control pills and menstruation. On the basis of birth-control pills, we may know that there is a high frequency of appearance of the same document regarding the relationship between birth-control pills and taking pills, including birth-control pills and menstruation.

(Fig. 4) Linkage analysis on keywords obtained in 2012
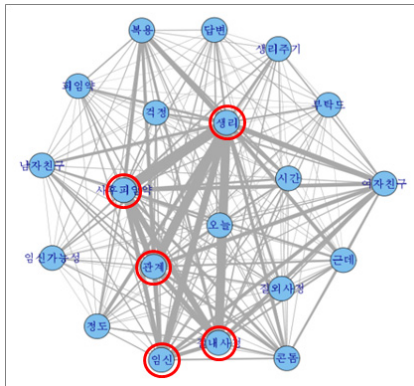

(Fig. 5) Linkage analysis on keywords obtained in 2013

(Fig. 6) Linkage analysis on keywords obtained in 2014

Finally, as for the year 2014, (Fig. 6) below shows that on the basis of menstruation thereis a high frequency of appearance of the same documents regarding the relationship between menstruation and pregnancy, menstruation and taking pills, including menstruation and birth-control pills. And also, we may know that there is a high frequency of appearance of the same document regarding the relationship between birth-control pills and taking pills, This result is the same as that of 2011, so that we In the year 2011, as shown in (Fig. 3), we may know that there is a high frequency of including birth-control pills and menstruation, on the basis of birth-control pills.

3.5 Linkage analysis on post-coital contraception-related keywords

A morpheme analysis was carried out for the articles which contained questions regarding post-coital contraception, so that the results of social network analysis on extracted nouns could be visualized. After establishing each keyword as a node, the visualization analysis was carried out with the network data on the basis of relationship among keywords, which were mentioned in the articles and contained the same question, by connecting them with lines. The thickness of lines between each keyword was adjusted according to the same frequency of appearance in the same document. The top 20 search keywords were subject to the analysis in terms of frequency, and the results of visualization were divided by years, and organized as follows.

(Fig. 5) shows the results of analysis on the data obtained in 2013, and we can evaluate the results from two main perspectives. Firstly, on the basis of menstruation, we may know that there is a high frequency of appearance of the same document regarding the relationship between menstruation and pregnancy, including menstruation and sexual relationship. And on the basis of birth-control pills, we may know that there is a high frequency of appearance of the same document regarding the relationship between birth-control pills and taking pills. Unlike the year 2011 and 2012, it was confirmed that on the basis of birth-control pills there is no high frequency of appearance of the same document regarding the relationship between birth-control pills and menstruation.

(Fig. 7) Linkage analysis on data keywords regarding post-coital contraception

The top 20 search keywords in terms of frequency were subject to the analysis. And according to the results, it was found out that the relationship between menstruation and post-coital contraceptive pills, menstruation and sexual relationship, menstruation and ejaculation inside vagina, including menstruation and pregnancy, had a high frequency of co-appearance in the same article.

3.6 Classification on data from post-coital contraception-related articles

(Table 2) below contains the analysis of the actual conditions of groups and characteristics of actual groups. Group 1 consists of women's questions, who took post-coital contraceptive pill after sexual relationship, regarding whether the administration method was correct, and the question about menstrual cycle after taking the pills. So, this group has been defined as 'Information Search Group'trying to get overall information about post-coital contraceptive pills from experts. Group 2 consists of questions from women, who recognized the information about post-coital contraceptive pills after a sexual relationship. This group has been defined as 'Group subject to Pre-education'as they are worried about pregnancy because the post-coital contraceptive pills would not work. Group 2 consists of women, who are worried about side effects of post-coital contraceptive pills, such as bleeding after taking the pills on the basis of prescription, so the group has been defined as 'Group with suspicion of efficacy of post-coital contraceptive pills'.

(Table 2) Analysis on data from post-coital contraception-related articles

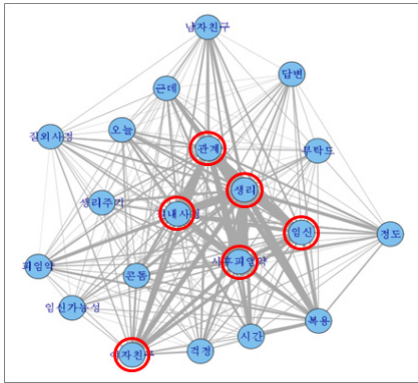| Group	Name of group	Characteristics of group	Total cases
Group 1	Information Search Group	Trying to get overall information about post-coital contraceptive pills	2,900
Group 2	Group subject to Pre-education	Worrying about the possibility of pregnancy after sexual relationship	269
Group 3	Group with suspicion of efficacy of post-coital contraceptive pills'	Worrying about efficacy and side effects of post-coital contraceptive pills after taking those pills	10
Total			3,179

(Table 3) Percentage of keyword exposure in articles with questions in each group

Group 1	Group 2	Group 3
Keyword (%)	Keyword (%)	Keyword (%)
Menstruation (13.3%)	Menstruation (13.8%)	Post-coital contraceptive pills (9.3%)
Post-coital contraceptive pills (11.1%)	Post-coital contraceptive pills (10.2%)	Ejaculation inside vagina (8.3%)
Ejaculation inside vagina (9.3%)	Ejaculation inside vagina(8.6%)	Girlfriend (6.5%)
Sexual relationship (7.6%)	Sexual relationship (7.4%)	Sexual relationship (5.6%)
Pregnancy (5.5%)	Pregnancy (6.4%)	Pregnancy (5.6%)
Girlfriend (4.6%)	Girlfriend (4.6%)	By the way (4.6%)

The frequency of keywords used by each group is presented in (Table 3) below. In the case of Group 1, the keywords like 'menstruation', 'post-coital contraceptive pills', 'sexual relationship', 'pregnancy', and 'taking pills' were at the top. In the case of Group 2, the keywords like 'menstruation', 'ejaculation inside vagina', 'taking pills', 'time', and 'possibility' had a high frequency. In the case of Group 2, the keywords such as 'post-coital contraceptive pills', 'prescription', 'irregular bleeding', and 'taking pills' were frequently used.

3.7 Linkage analysis on keywords in articles posted by men

(Fig. 8) shows the results of social networks analysis by using the top 20 search keywords in terms of frequency, which were derived from the frequency analysis of the keywords mentioned above.
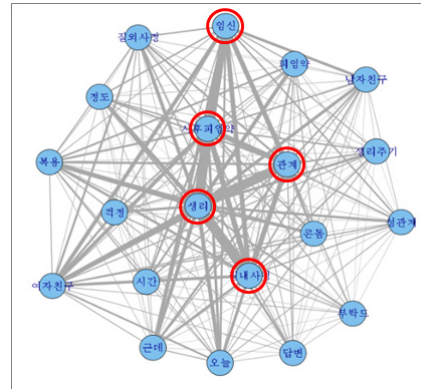
(Fig. 8) Linkage analysis on data keywords used by men

(Fig, 9) Linkage analysis on data keywords used by minors

After establishing each keyword as a node, the visualization analysis was carried out with the network data, in which the relationship among keywords appearing in the articles with same question was expressed by connecting them with lines. The thickness of lines between each keyword was adjusted according to the same frequency of appearance in the same document. According to the analysis results, the lines connecting menstruation, sexual relationship, pregnancy, ejaculation inside vagina, post-coital contraceptive pills, and girlfriend appeared to be thick, so that it means the above mentioned 6 keywords appeared repeatedly in the same document.

3.8 Linkage analysis on keywords in articles posted by minors

(Fig. 9) shows the results of social networks analysis by using the top 20 search keywords in terms of frequency, which were derived from the frequency analysis of the keywords mentioned above. After establishing each keyword as a node, the visualization analysis was carried out with the network data, in which the relationship among keywords appearing in the articles with same question was expressed by connecting them with lines. The thickness of lines between each keyword was adjusted according to thesame frequency of appearance in the same document. According to the analysis results, the keywords like menstruation, post-coital contraceptive pills, ejaculation inside vagina, sexual relationship, pregnancy appeared repeatedly in the same document.

4. Conclusions

The study results may be summarized in the following four points.

Firstly, the articles posted on the web are composed of question regarding possibility of pregnancy after sexual relationship. According to the analysis of such article with questions, it was found out that they were curious about the efficacy, side effects, and dose of post-coital contraceptive pills.

This also means that the users do not have sufficient and accurate information regarding efficacy and dose of post-coital contraceptive pills. So, we may assume that this is due to the fact that ordinary users lack the knowledge related to gynecology Accordingly, it is required to raise the awareness of post-coital contraceptive pills publicize the efficacy and effects of those pills prior to transfer the post-coital contraceptive pills to the category of non-prescription medicine.

Secondly, the keywords that are most closely related to post-coital contraception were post-coital contraceptive pills, menstruation, pregnancy, and sexual relationship. This is because the users are worried about pregnancy despite taking those pills after sexual relationship. As a result, we may assume that the users lack the accurate awareness of post-coital contraceptive pills. So, it implies that it is an important to carry out public-relations campaign and education in order to solve the problems.

Thirdly, the post-coital contraception-related articles posted

by men, except for the ones written by minors accounted for 24.4% of all the articles. This seems to be on the very level in comparison with the articles written by women, which account for 67.8%. When we look into the characteristics of articles posted by men specifically, we may see type of writing which frequently includes "they say ~". It is assumed that they are asking such questions regarding the information they recognize inaccurately, rather than the precise information about post-coital contraception. As both women and men have to be equipped with contraception- related knowledge, this implies that it is required to provide men with the education regarding efficacy of post-coital contraceptive pills and dose.

Fourthly, among the contraception-related articles, the articles posted by minors account for 9.7%, and the post-coital contraception-related articles written by minors account for 7.8% of all the articles. Like this, we may know that the minors account for a large percentage of population who are interested in post-coital contraception This implies that a number of minors have already experienced sex unlike the social atmosphere in which sex is banned for them. On a similar trend, Koreahas a social issue related to underage pregnancy, which is considered to be on the top level among the OECD countries (Kim, Seong-I, 2002) As the post-coital contraceptive pills may be a clue to the solution to reduce such social problems, we may considertransferring those pills to the category of non-prescription medicine. Currently, the post-coital contraceptive pills are have fallen into the category of prescription-based medicine, so it is difficult for the minors to use them, which are inaccessible even for adults

So, it is reasonable that the public relations regarding the use and side effects of those pills shall be put into practice prior to transferring them into the category of non-prescription medicine, and the time and procedure of conversion shall be decided on the basis of proper awareness.

It is difficult to decide that those article used in this study are based on the facts, because those articles have been collected from blogs and cafes that are opened to the public. It is expected that more information can be extracted in the next study by expanding the range of data collection in which the information from news and the reply to the relevant news, as well as the web social issues, are collected at the same time.

On the other hand, it is required to do manual labor for extraction and purification of terminologies obtained from crawled data, and it takes long time as it accounts for almost 70% of time for analysis.

If we can introduce the automatic methods such as the machine running-based text analysis or linguistic rule-based test analysis, we may reduce the time for analysis and derive outcomes with higher degree of completion.

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