Risk Perception of COVID–19 Community Transmission among the Spanish Population

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Abstract: On 11 March 2020 the SARS-CoV–2 virus was officially declared a pandemic and measures were set up in various countries to avoid its spread among the population. This paper aims to analyse the perception of risk of COVID–19 infection in the Spanish population. A cross-sectional, descriptive observational study was conducted with a total of 16,372 Spanish participants. An online survey was used to gather data for 5 consecutive days over the compulsory lockdown period which was established after the state of emergency was declared. There is an association between socio-demographic variables and risk perception, and a very strong relationship between this perception and contact and direct experience with the virus in a family, social or professional setting. We also found that compared to working from home, working outside the home increased the perception of risk of infection and the perception of worsening health. Understanding the public perception of the risk of COVID–19 infection is fundamental for establishing effective prevention measures.

Keywords: Covid19; SARS-CoV–2; community transmission; risk perception; public health

1. Introduction

According to the timeline established by the World Health Organisation (WHO), on 5 January the first report was published of an outbreak of pneumonia in China caused by a new virus. On 13 January, cases began to appear in areas outside China. On 30 January the new virus, dubbed SARS-CoV–2, was declared a public health emergency affecting 18 countries, and on 11 March it was officially declared a pandemic.

This novel coronavirus causes an illness called COVID–19, characterised as leading to serious pneumonia, although it is asymptomatic in 80% of cases [1]. Other typical symptoms include fever, dry cough, fatigue and aches [2,3], as well as gastrointestinal symptoms in 40% of cases, and other neurological and dermatological symptoms [4]. The patients considered to be the most vulnerable to...
developing symptoms are the elderly [5], due to the presence of immunosenescence [6], and people 
with existing conditions such as high blood pressure, cardiovascular diseases and diabetes [7].
It has been found to be highly contagious in the community, with transmission via respiratory 
droplets and direct contact [8]. Other studies discuss the possibility of aerosol transmission [9,10].
The first cases of COVID-19 in Spain occurred in February 2020 [11], in March, Europe became 
the epicentre of the pandemic [12]. France, Italy and Spain were the most affected countries with 
mortality rates of 15%, 13% and 11%, respectively. When analysing the data about mortality rate 
caused by COVID-19, it is important to consider that the different system of case registration among 
the European countries could have influenced the mortality rate differences.
Spain reached a peak on 3 April with 950 deaths per day (update No. 74). This situation posed a 
challenge for public health in these countries, which had to face the strong demand for health services, 
with a high number of hospital admissions and ICU admissions (26.5%) [13]. The recommendations 
supported personal hygiene measures, along with social distancing, as the most effective measures to 
stop the growth curve of cases [4,14,15]. In Spain, as had previously happened in Italy, mandatory 
confinement of the population was decreed on 14 March 2020 (Royal Decree 463/2020, 14 March) [16].
At that time, there were 7753 cases diagnosed in Spain, with a mortality rate of 3.7% of confirmed cases 
(Ministry of Health update No. 45).
The data on the number of infections, deaths and the saturation states of the hospitals was known 
by the population through different media, government information, social networks, television, 
radio, etc. Creating a social alarm that provoked fear among the population and a heightened risk 
perception [17,18] by associating the risk of infection with a real threat to their health [19].
At this time, it seemed interesting to inquire about monitoring preventive behaviours among 
the population and how these were associated or not with risk perception of SARS-CoV-2 contagion. 
This association seems interesting when observed in other pandemics as the relationship between risk 
perception and behaviour could offer information for the implementation of health policies, such as 
vaccination [20]. The authorities depend on monitoring the population for prevention measures to 
stop the spread of the virus [21,22]. Different factors studied in this pandemic increase risk perception, 
such as income level [23], vulnerability to the disease [24] and gender [25]. Other factors, such as lack 
of access to treatment or health services, are also associated with increased risk perception [26].
Risk perception belongs to the psychology category, which refers to an individual’s perception 
and understanding of the presence of objective danger to the individual or to the individual’s 
environment [27,28] Risk perception is an important factor that influences risk behaviours, such as 
whether or not to accept vaccination [29]. People with a lower risk perception tend to assume risky 
behaviours or reduce preventive behaviours, as shown by the Ding study, to the Chinese university 
population [21].

2. Materials and Methods
2.1. Study Design and Participant Selection
A cross-sectional, descriptive observational study was conducted with the participation of a total 
of 16,372 residents of Spain, 171 of whom were excluded for not meeting the criteria for inclusion (either 
they did not accept the informed consent statement, or they were under 18). In the end, the sample 
was 16,201 people (98.9% of the participants): 51.5% women and 48.5% men after weighting.
In order to get a large number of responses, we used non-probability consecutive sampling 
(snowball sampling). The initial bias of the sample was corrected by post-stratification, adjusting 
gross estimates according to gender and age, as proposed by Wang, Rothschild, Goel and Gelman [30]. 
Thus, in an appropriate statistical adjustment, non-random samples can generate accurate results, 
and refers to the importance of this type of survey for studying public opinion in different areas [30].
The adjustment method for the sample weighting was the iterative procedure with qualitative 
 auxiliary information [31]. This procedure is used when there are qualitative auxiliary variables...
(gender and age groups) and maximum information is available on the univariate distributions of these auxiliary variables in the population and in the sample. Stratification is carried out by crossing these auxiliary variables, specifically from a double-entry contingency table. In the first iteration, the elevators corresponding to the gender variable are obtained and in the second iteration those corresponding to the age groups. Each iteration consists of two steps (as there are only two adjustment variables): (1) the distribution is adjusted with respect to the marginal population distribution of the first variable and (2) with this new weighted sampling distribution, the distribution is adjusted to the second characteristic. Finally, the assignment of elevators (Table 1) has enabled corrections to be introduced in other variables considered independent, such as educational level and marital status. The method also partially compensates for non-coverage [31].

Table 1. Weights assigned to each substratum.

| Age Groups     | Men     | Women    | Total   |
|----------------|---------|----------|---------|
| Up to 30 years | 2.8101  | 0.8942   | 1.3703  |
| 31 to 64 years | 1.2379  | 0.5315   | 0.7424  |
| More than 64 years | 2.6100 | 3.8917 | 3.2073 |
| Total          | 1.5635  | 0.7468   | 1.0000  |

2.2. Data Collection

An online questionnaire was used to gather data for 5 consecutive days over the compulsory lockdown period which was established after the state of emergency was declared in Spain. The questionnaire was distributed via social networks, scientific associations, and various healthcare-related institutions.

A specific questionnaire was prepared for this project using the tool “Google Forms”. The questionnaire comprised 59 items divided into 4 content areas (socio-demographic aspects, characteristics of the experience, health aspects, and risk perception) and included the project objectives, the requirements for participation and instructions for filling in.

2.3. Variables

The dependent variable: to be studied was the perception of the risk of infection, a nominal variable with three categories (low, medium and high). The baseline variables which were considered as possible predictors of Perception of the risk of infection are as follows:

The Affect index is an ordinal variable (ranging in value from 0 = No affect to 1 = Maximum affect) constructed by standardising a set of diverse situations: a family member testing positive; a friend testing positive; somebody at work testing positive; death of a family member due to Covid−19).

Income was originally measured with an ordinal variable with 11 response categories, with extremes ≤€12,000 and >€300,000 euros. These categories were grouped into income quartiles: Q1: ≤€12,000; Q2: €12,001 to €22,500; Q3: €22,501 to €40,000; Q4: €40,001 to >€300,000.

The level of studies was classified into three levels: Primary studies (finished and unfinished); secondary studies (compulsory and post-compulsory) and higher studies (university).

The dichotomous variable work inside/outside the home was considered a possible predictor of risk perception since, remember, the survey was carried out in a period of confinement.

The coexistence variables (Who they live with) were also formulated dichotomously with response possibilities: Living alone and Living with others; if you live with a family member whose occupation is in healthcare (A family member works in healthcare, with Yes/No answers); Protective measures used (Protective measures, with Inadequate/Adequate categories); if Any family member has been affected (A member of the household is infected, with Yes/No answers).

Interviewees’ perception about whether their health had improved or worsened during confinement (Health status during confinement) was also considered a predictor variable, initially
measured with a Lickert scale and later grouped into three categories (Good/Very good; Average; Poor/Very poor).

2.4. Analysis

Next, we conducted a preliminary analysis of the joint distribution of Perception of the risk of infection and the selection of potentially predictive variables (Table 2). The frequencies were calculated for each bivariate relationship and the corresponding relative frequencies were expressed as percentages. The hypothesis of independence between the variables was resolved with a Pearson chi-square test and its significance for a two-tailed distribution scenario. We also calculated the size of the effect of each relationship with Cohen’s $d$, as proposed by Rosenthal and DiMatteo [32], Lenhard and Lenhard [33] and Ferguson [34]. This analysis was used to create the final selection of variables which became part of the multinomial logistic regression analysis. All analyses were carried out with a confidence level of 95% and, therefore, a margin of error $p = 0.05$.

The multinomial logistic regression analysis was proposed in order to find predictors of the categories of Perception of the risk of infection, taking as the reference category Risk perception: Low. This type of analysis is especially suitable for modelling categorical and polytomous dependent variables, and is a multivariate extension of the binary logistic regression, admitting both continuous variables (covariates) and categorical variables (factors) as predictive variables [35].

The variables used in the model were gender, age, Affect index, place of work (working from home/outside the home), income (quartiles), health during lockdown (good/average/poor), protection measures (adequate/inadequate), whether a family member works in healthcare (yes/no), whether a member of the household is infected (yes/no) and where they get information on the disease (press/radio/TV; social networks/WhatsApp; official media/scientific documents).

We decided the model would not include some of the variables studied in previous analyses, such as education level, marital status, working/non-working population, and who they live with (living alone/with others); despite presenting statistical significance in the chi-square test, the coefficients of the size of the effect measured with Cohen’s $d$ showed very small or negligible effects.

The parameters corresponding to the predictive variables were tested against the Wald test and its $p$-values, and the odds ratio (OR) of the coefficients and their confidence intervals were calculated. We also measured the goodness of the overall fit of the model with the chi-square test and the likelihood ratio test, and the percentage of correct classifications for each category. The goodness of fit was measured using the Nagelkerke pseudo R-squared parameter.

All the analyses were performed with the statistics program IBM SPSS v.21 (New York, NY, USA).

| Table 2. Variables and distribution. |
|--------------------------------------|
| Perception of the Risk of Infection | N   | %   |
| Low                                 | 7481| 46.2|
| Medium                              | 5408| 33.4|
| High                                | 3312| 20.4|
| Age                                 |     |     |
| Up to 30                            | 2651| 16.4|
| 31–64                               | 9700| 59.9|
| 65 and over                         | 3850| 23.8|
| Gender                              |     |     |
| Female                              | 8348| 51.5|
| Male                                | 7853| 48.5|
| Level of studies                    |     |     |
| Primary                             | 1575| 9.7 |
| Secondary                           | 5499| 33.9|
| University graduates                | 9126| 56.3|
### Table 2. Cont.

| Working population | No  | 4983 | 30.8 |
|--------------------|-----|------|------|
|                    | Yes | 69.2 |

| Marital status      | Single | 4726 | 29.2 |
|---------------------|--------|------|------|
|                     | Separated/Divorced | 1544 | 9.5 |
|                     | Married/Cohabiting  | 9376 | 57.9 |
|                     | Widowed | 555  | 3.4 |

| Where they work      | Working from home | 6272 | 48.0 |
|----------------------|-------------------|------|------|
|                      | Working outside the home | 6802 | 52.0 |

| Income: quartiles    | First quartile | 2519 | 16.5 |
|----------------------|---------------|------|------|
|                      | Second quartile | 5405 | 35.3 |
|                      | Third quartile  | 5729 | 37.4 |
|                      | Fourth quartile | 1655 | 10.8 |

| Who they live with   | Living alone | 2047 | 12.6 |
|----------------------|--------------|------|------|
|                      | Living with others | 87.4 |

| Health status during confinement | Good/Very good | 76.2 |
|----------------------------------|---------------|------|
|                                  | Average       | 3383 | 20.9 |
|                                  | Poor/Very poor| 464  | 2.9  |

| Protective measures     | Adequate | 71.9 |
|-------------------------|----------|------|
|                         | Inadequate | 4558 | 28.1 |

| You or relative work in healthcare | A family member works in healthcare |
|-----------------------------------|-------------------------------------|
| No                                | 76.6 |
| Yes                               | 23.4 |

| A member of the household is infected | No | 96.4 |
|--------------------------------------|----|------|
|                                      | Yes | 3.6  |

| How they get information          | Press/Radio/TV | 68.2 |
|-----------------------------------|----------------|------|
|                                   | Social networks/WhatsApp | 1521 | 9.4 |
|                                   | Official media/Scientific documents | 3630 | 22.4 |

Source: compiled by the authors.

#### 2.5. Ethical Aspects

The study was carried out in accordance with the principles of the Declaration of Helsinki and the laws and regulations in force in Europe and Spain and has been approved by the Research Ethics Committee University Europea (CIPI/20/138) and Research Ethics Committee with Medical Products of Cantabria (code: 2020.159).

Given the exceptional circumstances of the pandemic, and in line with the indications of the European Medicines Agency and the Ministry of Health, Consumer Affairs and Social Welfare, written informed consent was requested at the start of the online survey. It was imperative that the user accepted it in order to continue with the survey.

#### 3. Results

First, the sample distribution is presented taking the variables considered in the analysis processes into account.
The Age variable produced an average age of 48.92 (95% CI: 46.68; 49.16) and Std. Error = 0.123. The average age of men was 48.79 (95% CI: 48.45; 49.14) and Std. Error = 0.175, and the average age of women was 49.04 (95% CI: 48.70; 49.38) and Std. Error = 0.174. The Affect index produced an average value of 0.3105 (95% CI: 0.3058; 0.3152), with Std. Error = 0.0023.

Table 3 shows the variables which were considered to be possible predictors of Perception of the risk of infection.

Table 3. Joint distribution between Perception of the risk of infection and different variables. N and percentages in brackets.

| Gender (N = 16,201) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|---------------------|------|--------|------|--------------------|---------|-------------------|
| Male                | 3933 (50.1) | 2520 (32.1) | 1400 (17.8) |                   |         |                   |
| Female              | 3548 (42.5) | 5408 (33.4) | 3312 (20.4) | 108.98             | <0.001  | 0.165             |

| Age (N = 16,201) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|------------------|------|--------|------|--------------------|---------|-------------------|
| Up to 30         | 1363 (51.4) | 782 (29.5) | 506 (19.1) |                   |         |                   |
| 31–64            | 4107 (42.3) | 3450 (35.6) | 2143 (22.1) |                   |         |                   |
| 65 and over      | 2011 (52.5) | 1175 (30.5) | 664 (17.2) | 147.09             | <0.001  | 0.191             |

| Education level (N = 16,201) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|-----------------------------|------|--------|------|--------------------|---------|-------------------|
| Primary                     | 629 (39.9) | 573 (36.4) | 374 (23.7) |                   |         |                   |
| Secondary                   | 2580 (46.9) | 1874 (34.1) | 1045 (19.0) |                   |         |                   |
| University graduates        | 4271 (46.8) | 2962 (32.5) | 1893 (20.7) | 36.45              | <0.001  | 0.095             |

| Affect (N = 13,813) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|---------------------|------|--------|------|--------------------|---------|-------------------|
| None                | 2556 (56.5) | 1364 (30.2) | 601 (13.3) |                   |         |                   |
| Low                 | 1746 (45.9) | 1273 (33.4) | 787 (20.7) |                   |         |                   |
| Medium              | 1482 (42.5) | 1191 (34.1) | 818 (23.4) |                   |         |                   |
| High                | 624 (41.2) | 490 (32.3) | 402 (26.5) |                   |         |                   |
| Maximum             | 136 (30.6) | 148 (33.3) | 160 (36.0) | 360.88             | <0.001  | 0.328             |

| Marital status (N = 16,201) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|-----------------------------|------|--------|------|--------------------|---------|-------------------|
| Single                      | 2260 (47.8) | 1503 (31.8) | 963 (20.4) |                   |         |                   |
| Separated/Divorced          | 726 (47.0) | 504 (32.6) | 314 (20.3) |                   |         |                   |
| Married/Cohabitng           | 4217 (45.0) | 3256 (34.7) | 1903 (20.3) |                   |         |                   |
| Widowed                     | 278 (50.1) | 145 (26.1) | 132 (23.8) | 28.53              | <0.001  | 0.084             |

| Working population (N = 16,194) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|---------------------------------|------|--------|------|--------------------|---------|-------------------|
| Non-working pop.               | 2736 (54.9) | 1493 (30.0) | 755 (15.1) |                   |         |                   |
| Working pop.                    | 4744 (42.3) | 3913 (34.9) | 2554 (22.8) | 241.89             | <0.001  | 0.246             |

| Place of work (N = 14,187) | Low  | Medium | High | Pearson Chi-Square | p Value | Size Effect dCohen |
|---------------------------|------|--------|------|--------------------|---------|-------------------|
| At home                   | 3341 (53.3) | 2158 (34.4) | 773 (12.3) |                   |         |                   |
| Outside the home          | 2364 (34.8) | 2354 (34.6) | 2083 (30.6) | 756.53             | <0.001  | 0.475             |
Table 3. Cont.

| Economic situation (Impact on income) (N = 16,201) | Low (E) | Medium (M) | High (H) | Pearson Chi-Square | p Value | Size Effect $d_{Cohen}$ |
|-----------------------------------------------|---------|------------|---------|--------------------|---------|------------------------|
| Good                                          | 3731 (49.0) | 2332 (30.6) | 1550 (20.4) |                    |         |                        |
| Average                                       | 2933     | 2368       | 1393     |                    |         |                        |
| Poor                                          | 817 (43.1) | 708 (37.4)  | 369 (19.5) | 60.70              | <0.001  | 0.123                  |

Household income (N = 15,345)

| 1st quartile | 1244 (49.4) | 820 (32.6) | 455 (18.1) |
|--------------|-------------|------------|------------|
| 2nd quartile | 2338        | 1906       | 1162       |
|              | (43.2)      | (35.3)     | (21.5)     |
| 3rd quartile | 2618        | 1888       | 1223       |
|              | (45.7)      | (33.0)     | (21.3)     |
| 4th quartile | 791 (47.8)  | 494 (29.8) | 370 (22.4) |

Who they live with (N = 16,201)

| Living alone | 967 (47.2) | 634 (31.0) | 446 (21.8) |
|--------------|------------|------------|------------|
| Living with other(s) | 6513 | 4774 | 2867 |
|              | (46.0)     | (33.7)     | (20.3)     |

Health (N = 16,190)

| Good/Very good | 6192 (30.2) | 4027 (32.6) | 2125 (17.2) |
|               | (50.2)      | (33.7)     | (20.3)     |
| Average       | 1169        | 1248       | 966 (28.6) |
|              | (34.6)      | (36.9)     | (36.9)     |
| Poor/Very poor | 117 (25.2)  | 132 (28.4) | 215 (46.3) |

Protective measures used (N = 16,201)

| Adequate | 5012 (43.0) | 3927 (33.7) | 2704 (23.2) |
|----------|------------|------------|------------|
| Inadequate | 2469 | 1481 | 609 (13.4) |
|          | (54.2)     | (32.5)     | (27.5)     |

You or relative work in healthcare

Family member works in healthcare (N = 16,201)

| No | 6375 (51.4) | 4274 (34.5) | 1755 (14.1) |
|    | (51.4)      | (34.5)     | (14.1)     |
| Yes | 1105 | 1134 | 1558 |
|    | (29.1)     | (29.9)     | (41.0)     |
|    |           |            | 1358.72    |
|    |            |            | <0.001     | 0.605     |

Household member infected (N = 16,201)

| No | 7334 (46.9) | 5241 (33.6) | 3046 (19.5) |
|    | (46.9)      | (33.6)     | (19.5)     |
| Yes | 146 (25.3)  | 166 (28.7) | 266 (46.0) |
|    | (25.3)     | (28.7)     | (46.0)     |
|    | 146 (25.3)  | 166 (28.7) | 266 (46.0) |
|    |            |            | 252.43     |
|    |            |            | <0.001     | 0.252     |

Where they get information (N = 16,201)

| Press/Radio/TV | 5263 (47.6) | 3788 (34.3) | 1998 (18.1) |
| Social networks/WhatsApp | 741 (48.7) | 464 (30.5) | 316 (20.8) |
| Official media/Scientific documents | 1477 | 1156 | 998 (27.5) |
|            | (47.6)     | (34.3)     | (18.1)     |
|            | (48.7)     | (30.5)     | (20.8)     |
|            | (40.7)     | (31.8)     | (27.5)     |
|            |            |            | 236.99     |
|            |            |            | <0.001     | 0.244     |

Source: compiled by the authors.

All the variables presented statistical significance, but for some the size of the effect was negligible. As proposed by Cohen (1988), effect sizes of <0.2 can be considered as No Effect. This is the case for gender ($d_{Cohen} = 0.1646$), age ($d_{Cohen} = 0.1914$), education level ($d_{Cohen} = 0.095$), marital status...
(d_{Cohen} = 0.084), impact on income (d_{Cohen} = 0.1227) and who participants live with (d_{Cohen} = 0.0407).

Despite this, we decided to include gender in the model, as this variable contributes to including a gender perspective in the predictive model; and age, which we finally included not as a categorised variable but in its original form as a continuous variable.

Larger effect sizes corresponded to having a family member working in healthcare (d_{Cohen} = 0.6051), degree of affect (d_{Cohen} = 0.3276), the place of work (d_{Cohen} = 0.4747), personal health perceived during lockdown (d_{Cohen} = 0.3672), having an infected member of the household (d_{Cohen} = 0.2516), and protection measures (d_{Cohen} = 0.2478).

This first analysis could indicate an association between a higher perceived risk of infection and having a family member, friend or workmate test positive; working outside the home; perceiving one’s own health as poor during lockdown; someone in the household becoming infected; using adequate protective measures; and getting most of one’s information from official media and scientific documents.

Next, a prediction analysis of the categories of the dependent variable was performed through a multinomial logistic regression. In the analysis, a series of variables with statistical significance in the bivariate tests were selected, taking them as independent variables, and risk perception as the dependent variable. The multinomial model shows different OR values for the predictor variables, which offers an indication of the importance of these variables in determining risk perception.

The results of the model show an uneven predictive value: 82.2% for the category “Perception of the risk of infection: Low”, 15% for the category “Perception of the risk of infection: Medium”, and 49.0% for “Perception of the risk of infection: High”. The total percentage of correct prediction was 52.4% (Table 4), with a Kappa coefficient value of 0.223 (p < 0.001). The results show a significant model (−2log likelihood = 8.21; χ² = 2193.43; p < 0.001), with a moderate and acceptable goodness of fit Nagelkerke R² = 0.204.

Table 4. Table classifying the prediction of the categories of Perception of the risk of infection in the multinomial logistic regression model.

| Classification | Predicted | Percent Correct |
|----------------|-----------|-----------------|
|                | Low       | Medium          | High    |                  |
| Observed       | 4090      | 484            | 401     | 82.2%            |
| Low            | 2558      | 562            | 618     | 15.0%            |
| Medium         | 897       | 326            | 1176    | 49.0%            |
| Overall Percentage | 67.9%      | 12.3%          | 19.8%   | 52.4%            |

Source: compiled by the authors.

Tables 5 and 6 show the regression coefficients of the predictive variables for the Medium and High categories, respectively. The comparison of the OR values (Exp(B)) of the two tables shows a higher predictive value in the independent variables considered in a high perception of risk. In fact, it is 4.439 times more probable that perception of the risk of infection will be high among those whose health has been poor or very poor during lockdown, compared to those who experienced their health as good or very good. It is also 4.251 times more probable that people with family members working in healthcare have a higher perception of the risk of infection than those without. Other relevant OR values correspond to people who work outside the home, compared to those working from home (OR = 3.057), those with someone infected at home compared to those without (OR = 2.167), and to a lesser degree, being a woman rather than a man (OR = 1.531), and getting most of their information from official media or scientific documents, compared to the conventional media, press, radio and TV (OR = 1.258). It is also important to mention the affect index variable, which presents an OR = 2.770, and which reflects that higher values of affect coincide with a higher perception of risk of infection. However, as the scanty association between age and perception of the risk of infection shown in Table 2 seems to indicate, the model does not produce a significant regression coefficient for age. All of these tendencies can be seen in the predictions for the category Perception of the risk of infection: Medium, but with lower intensity in all the variables.
Table 5. Parameters of the multinomial logistic regression analysis for the category “Perception of the risk of infection: Medium”. The reference category is: Low.

| Risk of Infection: Medium | B     | Std. Error | Wald  | Sig. | OR      | 95% CI for OR |
|---------------------------|-------|------------|-------|------|---------|---------------|
| Intercept                 | -0.938| 0.099      | 89,821| 0.000| 0.403  |               |
| Age                       | 0.001 | 0.002      | 0.558 | 0.574| 1.004  |               |
| Affect (index)            | 0.502 | 0.08      | 38,983| 0.000| 1.652  |               |
| Gender (female)           | 0.291 | 0.045      | 1337  | 0.000| 1.225  |               |
| Working outside the home  | 0.457 | 0.046      | 1442  | 0.000| 1.185  |               |
| Health: poor/very poor    | 0.491 | 0.164      | 1185  | 0.000| 2.252  |               |
| Health: average           | 0.455 | 0.059      | 1405  | 0.000| 1.770  |               |
| Protective measures:      |       |            |       |      |         |               |
| adequate                  | -0.173| 0.048      | 0.841 | 0.361| 0.925  |               |
| Family member works in healthcare | 0.347 | 0.059 | 1415 | 0.000| 1.586  |               |
| A member of the household is infected | 0.244 | 0.145 | 1277 | 0.000| 1.968  |               |
| Information: official media | 0.030 | 0.056 | 1031 | 0.000| 1.494  |               |
| Information: social networks | -0.236| 0.078 | 0.790 | 0.374| 0.574  |               |

Source: compiled by the authors.

Table 6. Parameters of the multinomial logistic regression analysis for the category “Perception of the risk of infection: High”. The reference category is: Low.

| Risk of Infection: High | B     | Std. Error | Wald  | Sig. | OR      | 95% CI for OR |
|-------------------------|-------|------------|-------|------|---------|---------------|
| Intercept               | -2699 | 0.132      | 415,322| 0.000| 0.527  |               |
| Age                     | 0.004 | 0.002      | 1004  | 0.000| 1.000  |               |
| Affect (index)          | 1019  | 0.101      | 102,291| 0.000| 2.770  |               |
| Gender (female)         | 0.426 | 0.056      | 1531  | 0.000| 1.472  |               |
| Working outside the home| 1117  | 0.061      | 2712  | 0.000| 1.840  |               |
| Health: poor/very poor  | 10.49 | 0.163      | 4439  | 0.000| 1.210  |               |
| Health: average         | 0.788 | 0.069      | 3223  | 0.000| 1.519  |               |
| Protective measures:    |       |            |       |      |         |               |
| adequate                | -0.647| 0.067      | 0.524 | 0.46 | 0.597  |               |
| Family member works in healthcare | 1447 | 0.062 | 4251 | 0.000| 4.803  |               |
| A member of the household is infected | 0.773 | 0.142 | 2167 | 0.000| 2.686  |               |
| Information: official media | 0.229 | 0.066 | 1258 | 0.000| 1.431  |               |
| Information: social networks | -0.046| 0.095 | 0.793 | 0.374| 0.574  |               |

Source: compiled by the authors.

To sum up, the multinomial model highlights better prediction in the category “Perception of the risk of infection: High”, compared to the middle category, which is more poorly defined, probably due to the tendency for those surveyed to place some items in middling positions when they have to do with assessments and/or perceptions of situations experienced during the COVID–19 lockdown.

4. Discussion

This study presents the risk perception of the Spanish public during the lockdown period coinciding with the maximum peak of infection of the pandemic. It shows an association of risk perception with socio-demographic variables and level of affect. Affect is understood as a variable of proximity to the disease, through direct contact or in the workplace, household or social circle.

A preliminary analysis shows that people who put inadequate prevention measures in place scored higher in low risk perception. Many studies refer to the important role of risk perception when establishing behaviour which will protect health in a pandemic [36–39] Specifically, the review by Bish and Michie [40] shows the association between perceived personal and family susceptibility to the development of a disease and the presence of preventive behaviour (hand washing, household hygiene, wearing masks, etc.) and avoidance behaviour (avoiding going to public places, restaurants, shops, etc.).
Some of these papers place particular emphasis on the need to present concrete interventions and directives to the general public, or focused on specific groups, to help give them an outlook which strikes a balance between the risk they face and the risk they perceive [37]. For this reason, knowing what factors are associated with a greater perception of risk is fundamental when taking effective measures in a pandemic.

4.1. Influence of Socio-Demographic Variables on Risk Perception

The data indicate that women perceive more risk, in line with the study by Dryhurst et al. [22] which concludes that men perceive lower levels of risk than women. Women appear to be more susceptible to suffering from virus-borne diseases, and to present a greater incidence and severity of the disease [41]. Additionally, other studies conclude that more women are infected with SARS-CoV–2 via the main causes of infection: being a healthcare worker, visiting a medical centre, close contact with a person with an acute respiratory infection, direct contact with probable or confirmed cases of COVID–19 [42], or being an informal caregiver [43].

All of this seems to justify women having a greater perception of risk.

Bearing in mind that the elderly population are at greater risk of death [6,44], it is notable that this group, to a lesser degree, also has a high risk perception. These results are in line with the findings of Barber and Kim [25], in which they explain how elder adults report less concern and present less anxiety over health than younger adults; and they contradict other studies which determine that the elderly are one of the groups with a higher perception of threats [36,45].

4.2. Relationship of the Perception of the Risk of Infection with Contact with COVID-19 and Affect Level

A higher level of affect, understood as direct contact, correlates to an increased risk perception.

Direct contact with SARS-CoV–2 relates to a greater perception of risk; more specifically, having a family member working in healthcare, or having lived with somebody infected. Other studies support the results obtained, concluding that people who have had a direct personal experience with the virus, and people who have received more information about it, present a higher risk perception [22].

Meanwhile, it can be observed that workers who work outside the home have a high-risk perception. This is attested by studies such as Ruiz-Frutos et al. [46], which affirm that people working outside the home present higher levels of loss of sleep, unhappiness and depression. The authors associate this fact with the existence of a greater perception of risk of infection for the subjects or their families, compared to people working from home.

Many studies discuss the fact that healthcare workers’ heavy exposure to SARS-CoV–2 means they have an increased perception of the risk of infection [47–49], with nurses as a group showing a higher perception than doctors [50].

4.3. Correlation between the Perceived State of Health and Perceived Risk of Infection

We observe that people who perceive their own health as poor or very poor are the ones with the highest perception of risk [51,52]. However, they also present fear of going to hospital, demonstrated in a decrease in hospital admissions for such significant pathologies as myocardial infarction [53] and stroke during the lockdown period [54]. Additionally, multiple studies show that the presence of comorbidities increases the severity and risk of death of COVID–19 [55–57], a fact which may justify a sense of greater risk among the more vulnerable.

4.4. Limitations

The main limitation of this paper is that the sample was not randomised, limiting the general applicability of the results. Even so, the large size of the sample means we can regard it as fairly representative. The circumstances of the pandemic prevented the use of more accurate sampling methods, but nevertheless the results obtained are highly significant and could be the basis for future papers and work with randomised samples.
The fact that the sample is not comparable has likely led to bias in the response, highlighting the fact that more women than men and more people with university studies responded to it. This has partially been corrected using post-stratification methods, although the response bias is not completely eliminated. There continues to be a slight over-representation of people with higher education. This fact must be taken into account when interpreting the results.

This work has attempted to measure risk perception that each of the respondents considered they had and, therefore, the following question was formulated: What do you consider is your risk of infection? Where 1 is the minimum and 5 the maximum. It is a subjective measurement and, therefore, it is understood that it could vary depending on the knowledge and individual characteristics of each one of them. Therefore, even with no objective measurement of risk, this work focused on individuals’ subjective perception in an extreme situation of confinement. This variable reflected in the questionnaire thus enables the necessary data to carry out this study on the subjectivity of the impact of the disease to be obtained.

To carry out this study, our own survey was used, designed ad hoc and, therefore, with no specific sensitivity and specificity analysis. This survey does not contain any validated tool. Despite the design of the study does not allow to extrapolate the results to all the Spanish population, we consider that the population sample used makes that the data can be used as a guide to perform effective prevention strategies and developing new research projects.

Finally, it should also be noted that despite the statistical significance shown by some crossovers of variables, effect sizes <0.30 indicate that caution must be exercised when determining clear associations, so this represents an added limitation to the time to build strong relationships. In our analyses, this fact has been taken into account and clearly specified when low effect sizes were obtained.

5. Conclusions

Understanding the perception of the risk of COVID−19 infection is fundamental for establishing prevention strategies among the public.

An association can be observed between socio-demographic variables and risk perception, and a very strong relationship between this perception and contact and direct experience with the virus in a family, social or professional setting. The logistic model also finds that working outside the home increases the perception of risk of infection, compared to people working from home. Additionally, the perception of worsening personal health is strongly associated with greater perception of the risk of infection, as is living with a family member who works in healthcare.

Applicability of the Results and Future Lines of Research

After carrying out this work, it is considered appropriate to develop new research projects aimed at knowing in detail what the behavioural and emotional responses of the population are, as well as their evolution during an epidemic or pandemic period. Specifically, one aspect that can be addressed in depth in future work is the fear of being stigmatised or discriminated against for having a positive test for COVID−19. A multidisciplinary perspective combines biological, psychological, and sociological aspects. Therefore, a multidisciplinary approach which also includes the psychological aspect, should be considered by the worldwide health policy makers [58]. It is also important to note that the groups that present a greater risk and fear perception are those that need the most support [59] and, therefore, require more complex investigations that place the focus of their objectives on it.

Dryhurst et al. identify the important role of risk perception in motivating health protection behaviours, especially during the COVID−19 pandemic [22]. They find that risk perception is positively and significantly correlated with an index of preventive health behaviours such as washing hands, wearing a mask and physical distancing and also point out that minimised as well as exaggerated risk perceptions can potentially undermine the adoption of behaviours to protect the [22]. Thus, higher risk perceptions lead to more protective behaviours, although taking effective measures can also reduce risk perception. Therefore, we highlight and suggest the importance of evaluating the accuracy of public
risk perceptions and the correlation with taking positive protective behaviour measures. Among others, we should consider the vaccine acceptancy, being this one of the top 10 threats to global health in 2019 [60].

The providers of the different health systems in the different states must guarantee easy access to qualified information and support measures. Specifically, a transparent information policy that balances identifying risks, promoting appropriate behaviour and avoiding sensational reporting styles.

Policy-makers often conceptualise risk as the probability of contracting a disease multiplied by the magnitude of the consequences. However, our findings, which present evidence of how people perceived the risk of COVID–19 infection in Spain in the first wave, clearly illustrate that risk perceptions are consistently correlated with a number of experiential and sociocultural factors. More specifically, it is shown that risk perception among the population is higher in those with direct personal experience of the virus.

Therefore, health risk communication messages tend to be more effective when they include information on the effectiveness of measures aimed at protecting people from illness personally as well as socially.

Cori et al. indicate that knowledge implies the growth of collective awareness, increased self-efficacy and empowerment to contribute to political decision-making [61]. Mutual trust and dependence on local communication networks among peers could exponentially increase the possibilities to apply flexible measures, introducing concepts that promote health and well-being linked to healing, collaboration and solidarity. Therefore, the implementation of community interventions is recommended mainly in population groups in which risk perception is poorer.

Although this study is only observational and could be expanded with experimental studies, what does seem clear is that a better understanding of the knowledge that people have, as well as the social and cultural factors that accompany them, help to understand the risk perception of COVID–19 contagion in the world and its role in motivating preventive health behaviours. This information could help policymakers to design evidence-based risk communication strategies.

Therefore, future research is advised to consider expanding this research.

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