



Original Article

A patient caregiver survey in Indonesia: Knowledge and perception of antibiotic use and microbial resistance



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ABSTRACT

Background: A successful antibiotic stewardship program depends not only the knowledge and perceptions of healthcare providers but also patients and caregivers. Accordingly, the caregiver will decide to give the medication for their children. This survey was conducted to observe the caregivers' knowledge and perceptions of antibiotic use and antibiotic resistance; and their relationship.

Methods: We developed 14 item questions in a knowledge questionnaire and 30 item questions in a perception questionnaire. The knowledge questionnaire was measured by a Guttman scale, with 'Yes' or 'No' answers, while the perception questionnaire used a five-point Likert scale.

Results: The knowledge about antibiotic resistance is low, while the knowledge about antibiotic administration was the highest score. Caregivers' perceptions and beliefs about antibiotic use and antibiotic resistance were mostly in the neutral category. The association between knowledge and perceptions about antibiotic use and antibiotic resistance in this study was weak.

Conclusions: The caregivers' knowledge about antibiotic use was identified to be sufficient, particularly, the antibiotic definition (highest score). The caregivers' belief about antibiotic use and microbial resistance was neutral (3.5–3.7).

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Introduction

Antibiotic Stewardship, a specific management program to manage antibiotic resistance, is an effort involving an entire health service organization which focuses on optimizing the use of antibiotics. This program is meant to provide an effective treatment to the patients, to improve any negative consequences such as toxicity, resistance, and to save money [1]. In Indonesia, Antibiotic Stewardship Programs in hospitals are called *Program Pengendalian Resistensi Antimikroba* (PPRA) [2]. Each hospital has to have a PPRA. The PPRA are responsible for managing the development of resistant microbes through minimizing antibiotic selection pressure toward microbe survival by using antibiotics appropriately.

Therefore, PPRA monitors, evaluates and works to increase the compliance to the antibiotic use guidelines by publishing management operating procedures and protocols [2]. In addition to that, a better patient understanding, and awareness will encourage a prudent antibiotic indication and administration. They have to know about not only antibiotic indication, but also the microbial resistance process and how it spreads. The handwashing practices should be routinely demonstrated and hopefully would become a healthy habit [3].

The patients' and caregivers' knowledge is an important factor [4–8] and essential to correct belief and behavior in their responsible antibiotic use [6,7]. When they have proper knowledge, they will have a strong belief and appropriate attitudes towards the treatment, self-health attention and good health management in dealing with illness and treatment [9–11]. A survey in Sweden showed that there is a lack of knowledge about antibiotics among people in many communities around the world. Generally, many

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Table 1
Hospital demography.

Characteristics	A	B	C	D	E
Hospital classification ^a	A	B	C	B	B
Levels of care	A tertiary hospital	A tertiary hospital	A secondary hospital	A tertiary hospital	A tertiary hospital
Number of beds	467	328	109	235	117
Area geographical	Sidoarjo regency	Gresik regency	Bangil district	Surabaya municipality	Surabaya municipality
Ownership	Government	Government	Government	Private	Private

^a In conformity with the Ministry of Health Republic of Indonesia (MoH-RI) regulation, Peraturan Menteri Kesehatan No. 56 tahun 2014: Klasifikasi dan perizinan rumah sakit: MoH-RI; 2014 [17].

Table 2
Respondents' demography.

Characteristics	A (%)	B (%)	C (%)	D (%)	E (%)
Age (years)					
≤20	0 (0)	0 (0)	5 (5.2)	0 (0)	0 (0)
>20–25	0 (0)	6 (6.3)	8 (8.3)	4 (4.2)	5 (5.2)
>25–30	19 (19.8)	21 (21.9)	17 (17.7)	25 (26)	29 (30.2)
>30–35	16 (16.7)	28 (29.2)	18 (18.8)	34 (35.4)	31 (32.3)
>35–40	28 (29.2)	14 (14.6)	10 (10.4)	26 (27.1)	26 (27.1)
>40–45	22 (22.9)	16 (16.7)	20 (20.8)	3 (3.1)	5 (5.2)
>45–50	3 (3.1)	9 (9.4)	8 (8.3)	2 (2.1)	0 (0)
>50–55	0 (0)	0 (0)	6 (6.3)	0 (0)	0 (0)
>55–60	0 (0)	2 (2.1)	2 (2.1)	1 (1)	0 (0)
>60	0 (0)	0 (0)	2 (2.1)	0 (0)	0 (0)
Not available	8 (8.3)	0 (0)	0 (0)	1 (1)	0 (0)
Sex					
Male	12 (12.5)	21 (21.9)	37 (38.5)	19 (19.8)	31 (32.3)
Female	84 (87.5)	75 (78.1)	59 (61.5)	77 (80.2)	65 (67.7)
Education					
Primary school	8 (8.3)	6 (6.3)	33 (34.4)	0 (0)	0 (0)
Middle school	13 (13.5)	24 (25)	25 (26)	1 (1)	0 (0)
High school	45 (46.9)	42 (43.8)	28 (29.2)	26 (27.1)	36 (37.5)
University	30 (31.3)	22 (22.9)	10 (10.4)	68 (70.8)	60 (62.5)
Not available	0 (0)	2 (2.1)	0 (0)	1 (1)	0 (0)
Monthly income					
Less than IDR1,000,000	44 (45.8)	5 (5.2)	57 (59.4)	1 (1)	0 (0)
IDR1,000,000– 3,000,000	13 (13.5)	28 (29.2)	29 (30.2)	11 (11.5)	1 (1)
IDR3,000,001– 5,000,000	31 (32.3)	9 (9.4)	10 (10.4)	36 (37.5)	34 (35.4)
IDR5,000,001– 10,000,000	8 (8.3)	1 (1)	0 (0)	27 (28.1)	42 (43.8)
More than IDR10,000,000	0 (0)	0 (0)	0 (0)	17 (17.7)	19 (19.79)
Not available	0 (0)	53 (55.2)	0 (0)	4 (4.2)	0 (0)

people were unsure whether antibiotics were indicated for bacterial and/or viral infection [12].

Based on research done with Americans about perceptions and knowledge, from 215 respondents, most of them agreed that the improper use of antibiotics could cause antibiotic resistance (92%). However, more than 70% responded neutrally or did not agree with the statement that antibiotic resistance was a problem. The conclusion of the research indicated that the participants are aware that antibiotic abuse could cause antibiotic resistance. Nevertheless, most people had the correct perception but incorrectly assumed that this issue was not an important matter [13].

This research was aimed to measure the parent's knowledge and beliefs about antibiotic use; and therefore, to what extent parents need to know about the wise use of antibiotics in their children. The use of antibiotics in children depends upon their parents, who become the decision makers in the medical treatment of their children. Based on the *Narrative Review of Pediatric Decision Making*, out of 55 articles, 52 different descriptive qualitative studies indicated that the decision making in children's medical treatment, namely by parents were also influenced by factors such as the health condition of their children, the knowledge of the parents, and personal reasons like emotions and beliefs [14,15]. In children, the knowledge and perceptions of the parents were measured as the indicators of the achievement of the proper use of antibiotics. This study was implemented with hospital outpatients and not inpatients, because in hospital settings the parents' participation

in medical treatment can be influenced more by nurses and other care providers [16].

Methods

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the respective hospital managements and was conducted in accordance with the Indonesian Law for the Protection of Personal Data. The study was ethically cleared by the Health Research Ethics Committee of Politeknik Kesehatan Kemenkes Surabaya, Kementerian Kesehatan No. 025/S/KEPK/V/2017. This research was conducted at five hospitals in East Java, i.e. one public hospital in Sidoarjo regency, one public hospital in Gresik regency, and one public hospital in Bangil district, and two private hospitals in Surabaya city (Table 1). These hospitals are representative of the various types of hospitals in Indonesia [17].

Measurements

This cross-sectional study used questionnaires with a Guttman scale (Yes or No) to measure caregiver knowledge (14 questions) and a 5-point Likert scale to measure perceptions (30 questions)

Table 3
The percentage of the respondents' correct answer on knowledge questionnaire.

Question	A (%)	B (%)	C (%)	D (%)	E (%)
Topic : Antibiotic definition <i>Pengertian antibiotik</i>					
1. Antibiotics are medicines that are useful for killing and weakening bacteria <i>Antibiotik adalah obat yang berguna untuk membunuh dan melemahkan kuman</i>	96 (100)	96 (100)	88 (91.7)	92 (95.8)	91 (94.8)
Topic : Healthcare role <i>Peranan tenaga kesehatan</i>					
2. The selection of antibiotics is not always performed by doctors or pharmacists <i>Pemilihan antibiotik tidak mesti dipilih oleh dokter maupun apoteker</i>	73 (76)	64 (66.7)	56 (58.3)	77 (80.2)	65 (67.7)
Topic : Antibiotic administration <i>Aturan pakai antibiotik</i>					
3. Antibiotics should be consumed regularly at certain times and should not be late <i>Minum antibiotik harus secara teratur dan tidak boleh terlambat</i>	91 (94.8)	83 (86.5)	88 (91.7)	95 (99)	86 (89.6)
4. Buying or discontinuing the use of antibiotics without any notification from doctors/pharmacists does not result in bacterial resistance to antibiotics <i>Membeli maupun menghentikan minum antibiotik tanpa sepengetahuan dokter/apoteker tidak menimbulkan kekebalan terhadap antibiotik</i>	69 (71.9)	47 (48.1)	58 (60.4)	69 (71.9)	73 (76)
7. Antibiotics must be regularly consumed until the course of prescription has finished <i>Tidak boleh untuk minum antibiotik setiap harinya sampai habis</i>	83 (86.5)	78 (81.3)	80 (83.3)	96 (100)	84 (87.5)
8. Consuming half the prescribed dosage of antibiotics is allowed <i>Antibiotik dapat diminum setengah dari dosis yang diresepkan</i>	85 (88.5)	67 (69.8)	61 (63.5)	94 (97.9)	80 (83.3)
9. Antibiotics should be taken until finished <i>Antibiotik harus diminum sampai habis</i>	88 (91.7)	71 (74)	86 (89.6)	90 (93.8)	85 (88.5)
10. In case forgetting to take antibiotics at the specified time, antibiotics must be taken 2 doses for the next time <i>Jika lupa minum antibiotik dari jadwal minumnya, antibiotik harus diminum langsung 2x pada waktu minum berikutnya</i>	87 (90.6)	80 (83.4)	74 (77.1)	84 (87.5)	82 (85.4)
11. Antibiotics can be stopped immediately if symptoms have improved, even though the antibiotics are not yet finished <i>Antibiotik dapat segera dihentikan jika gejala sudah membaik walaupun belum habis sesuai yang diresepkan dokter</i>	78 (81.3)	53 (55.2)	39 (40.6)	85 (88.5)	73 (76)
12. If the condition has improved, the dosage of antibiotics must remain the same until all antibiotic tablets are finished <i>Jika kondisi sudah membaik, takaran antibiotik yang diminum harus tetap sama hingga seluruh tablet antibiotik habis</i>	80 (83.3)	64 (66.7)	68 (70.8)	92 (95.8)	81 (84.4)
13. The dosage of antibiotics can be reduced by him/her self if the body condition feels better <i>Takaran antibiotik dapat diturunkan sendiri jika merasa badan sudah lebih baik</i>	78 (81.3)	68 (70.9)	55 (57.3)	93 (96.9)	77 (80.2)
14. The remaining antibiotics can be stored and taken again if the same illness occurs <i>Antibiotik yang tersisa dapat disimpan dan diminum kembali jika muncul sakit yang sama</i>	76 (79.2)	66 (68.8)	59 (61.5)	92 (95.8)	72 (75)
Topic : Antibiotic resistance <i>Resistensi Antibiotika</i>					
5. Antibiotic resistance is a condition in which antibiotics are successful in combating bacteria <i>Resistensi antibiotik merupakan suatu keadaan dimana antibiotik berhasil melawan bakteri</i>	24 (25)	20 (20.9)	17 (17.7)	47 (49)	52 (54.2)
6. Antimicrobial resistance to antibiotics can be prevented by stop antibiotics as soon as possible if you feel healed <i>Kekebalan terhadap antibiotik dapat dicegah dengan cara menghentikan antibiotik secepatnya jika sudah merasa sembuh</i>	53 (55.2)	26 (27.1)	35 (36.5)	91 (94.8)	64 (66.7)

about antibiotic use and antibiotic resistance (1 for strongly disagree and 5 for strongly agree). There were four domains in the knowledge questionnaire, i.e.: knowledge about antibiotic definition (1 question), antibiotic resistance (2 questions), healthcare role (1 question); and antibiotic administration (10 questions) (Table 3). The percentage of correct answers for every item was depicted descriptively. There were thirty questions in the patient belief questionnaire, i.e. 8 questions on perceived benefits, 6 questions on perceived barriers, 8 questions on perceived threats, and 8 questions on self-efficacy (Appendix 1).

Participants

The participants of this study were the parents of the outpatient children who were prescribed and administered antibiotics (Table 2). The inclusion criteria for sample selection were: the parents of the outpatient children who got antibiotics prescriptions from the physician, the age of the children was 1 month to 15 years old, and the participants could communicate and had good reading and writing ability. The exclusion criteria were: the parents of children treated as inpatients <1 month or >15 years old, and who could not complete the surveys.

Results

There were 480 questionnaires distributed but only 329 participants completed the surveys. One hundred and fifty-one questionnaire demographic data were incomplete, and mostly

were questions related with income (salary). From 329 participants who completed the questionnaire, 69.0% of participants were female. The age of the respondents ranged 25–45 years old in Hospital A, B, and C; whereas it was between 25–40 years old in Hospital D and E. More than 70% reached primary – high school and more than 50% of respondents have monthly income <IDR 3.000.000 in the government hospitals (Hospital A, B, C); while almost all finished high school and university and more than 50% of respondents have monthly income > IDR 3.000.000 in private hospitals (Hospital D, E). More than 50% of respondents in one hospital did not answer the question about monthly income (Table 2).

The participants had strong knowledge scores on antibiotic administration and antibiotic definition (high: 87.5% and 94.8%, respectively), average on healthcare role (high: 68.4%), and weak conceptions of knowledge about antibiotic resistance (high: 25.2%) (Table 2). Questions with correct answers less than 60% were (i) 'The selection of antibiotics is not always performed by doctors or pharmacists' in Hospital C (Bangil district), (ii) 'The dosage of antibiotics can be reduced by him/her self if the body condition feels better' in Hospital C, (iii) 'Buying or discontinuing the use of antibiotics without any notification from doctors/pharmacists does not result in bacterial resistance to antibiotics' in Hospital B (Gresik regency), (iv) 'Antibiotics can be stopped immediately if symptoms have improved, even though the antibiotics are not yet finished' in Hospital B and C, (v) 'Antimicrobial resistance to antibiotics can be prevented by stop antibiotics as soon as possible if you feel healed' in Hospital A–B–C, and (vi) 'Antibiotic resistance is a con-

Table 4
The respondents' perceived score.

Domain	A	B	C	D	E
Perceived benefit	3.34	3.51	3.15	3.58	3.38
Perceived barrier	3.60	3.57	3.43	3.31	3.30
Perceived threat	3.59	3.95	3.59	3.77	3.59
Perceived self-efficacy	3.81	3.85	3.75	3.81	3.64
Belief	3.58	3.73	3.48	3.64	3.49

dition in which antibiotics are successful in combating bacteria' in all hospitals (Table 3).

Individual beliefs consist of four domains, i.e. threats felt or perceived threats, benefits felt or perceived benefits, barriers felt or perceived barriers and beliefs towards what they can do or perceived self-efficacy. The perceived self-efficacy had the highest score; the perceived benefits and barriers had the lowest score. The overall respondents' belief score was 3.5–3.6 (Table 4, Appendix 1).

Discussion

This study shows that the caregivers' knowledge about antibiotic was sufficient. Ninety-six percent and ninety-two percent of participants respectively answered the questions about antibiotic definition and administration correctly. This information was usually given by pharmacists whenever the patient took their medication at a pharmacy [18]. The results of the knowledge of the participants were also related to previous personal experience and the quality of the information provided [19]. Patients with good knowledge were more likely to have good antibiotic practices [20].

The lowest score for correct answers was the question about antibiotic resistance. Only thirty-three percent of respondents answered it correctly. The lack of respondents' knowledge about antibiotic resistance in this study was similar with research by Andre et al. in the US, which indicated that people, in general, were still confused about antibiotic resistance and believed that people, not bacteria, would become resistant to antibiotics [21]. This study showed that respondents from the private hospitals more likely answered correctly the question, 'antibiotic resistance is a condition in which antibiotics are successful in combating bacteria' than respondents from the public hospitals. The number of respondents with a university degree at private hospitals was almost three times higher than the number of respondents with a university degree at public hospitals. This finding supported the findings from the Davis study, where ninety-three percent of patients with college level education correctly believed that antibiotics work for treating infections from bacteria whereas only eighty percent of patients without college level education believed it [22].

In this study, the knowledge result agrees with the perceived benefit score (3.4), indicating the respondents believe antibiotics are effective and prevent any disease from getting worse. The results concurred with Hamm et al.'s study, sixty-five percent of patients expected antibiotics to treat their sinusitis or bronchitis and even when diagnosed with viral infections [23]. Hansen et al.'s study in 2015 showed that parents in Brisbane, Australia assumed that antibiotics were the best treatment for acute otitis media in children [24]. In 2017, a systematic review summary stated that parents are not disappointed for not prescribing antibiotics if the physician provided a proper explanation and an alternative plan

(in case the symptom were getting worse) [10]. Some respondents believed that antibiotics are a medicine to prevent diseases and not a medicine to cure diseases; [21,25] or antibiotics cure common colds more quickly [26].

In this study, more than 50% of parents of the children patients in the hospitals feel a barrier to follow the antibiotic administration instruction, i.e. 'difficult to take antibiotics every 8 h a day'. This result was similar to studies by Ingerski [27] and Modi [28] that found the barriers to treatment adherence involved difficulties with time management. This situation would threaten antibiotic effectiveness, particularly for a time-dependent antibiotic.

Conclusion

Knowledge of the caregivers of children patients in the hospitals in the antibiotic administration and definition was identified to be sufficient for getting benefits from antibiotics and having to administer them regularly. The belief of the caregivers in the hospitals in antibiotic use was neutral. The knowledge about antibiotic resistance and their perceived barrier score were low. Considering their essential role, caregivers are one of the important targets of the educational strategy in successful antibiotic stewardship programs [26]. Continued public awareness campaigns and education are necessary to increase their knowledge, to strengthen their beliefs and to improve their health behavior.

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Conflict of interest

The authors declare that they have no conflict of interest.

Key points

The appropriateness of children medications depends on the caregivers' knowledge and perceptions. This study shows that the caregivers' knowledge and perceptions are low, therefore continued public awareness campaigns and education are necessary to increase their knowledge, to strengthen their beliefs and to improve their health behavior.

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APPENDIX 1 Questionnaire on patient's belief

No	Statements	Strongly disagree→ strongly agree
1	Despite the bitter taste of antibiotics, my child has to take them because I know my child can recover	1 – 2 – 3 – 4 – 5
2	If my child's bacteria is susceptible to antibiotics, I can use cheaper drugs for my child	1 – 2 – 3 – 4 – 5
3	If my child completes the course of antibiotic, I can reduce the risk of antibiotic resistance	1 – 2 – 3 – 4 – 5

4	If my child takes antibiotics until finished, my child can recover	1 – 2 – 3 – 4 – 5
5	For any illness, I need to take antibiotics so that I can quickly recover	1 – 2 – 3 – 4 – 5
6	Antibiotics have few side effects	1 – 2 – 3 – 4 – 5
7	I choose antibiotics because they are safe to use	1 – 2 – 3 – 4 – 5
8	Antibiotics are used to prevent my child's illness from getting worse	1 – 2 – 3 – 4 – 5
Perceived barrier		
9	If the prescription stated to take antibiotics every 8 h a day, it makes me feel difficulty to arrange drug schedule for my child	1 – 2 – 3 – 4 – 5
10	My child has difficulty taking antibiotics because of the bitter taste	1 – 2 – 3 – 4 – 5
11	The relatively large size of antibiotic tablets makes my child face difficulty to take them	1 – 2 – 3 – 4 – 5
12	Taking 3x one day's antibiotic for my child can be given in the morning at 06.00, noon at 14.00 and in the afternoon at 18:00	1 – 2 – 3 – 4 – 5
13	My child is not allowed to drink milk when he/she take antibiotics	1 – 2 – 3 – 4 – 5
14	My child wants to take antibiotics, if they are syrup	1 – 2 – 3 – 4 – 5
Perceived threat		
15	Taking antibiotics not in accordance with the doctor's recommended dosage will worsen my child's illness	1 – 2 – 3 – 4 – 5
16	Antibiotic treatment without a doctor's prescription leads to bacterial in my child's body resistance to antibiotics	1 – 2 – 3 – 4 – 5
17	Using antibiotics not in accordance with the prescription leads to longer treatment duration	1 – 2 – 3 – 4 – 5
18	Taking antibiotics irregularly can cause fatal side effects such as death	1 – 2 – 3 – 4 – 5
19	Taking antibiotics without a doctor's prescription leads to difficulty in treating my child's illness	1 – 2 – 3 – 4 – 5
20	The use of antibiotics not in accordance with the doctor's prescribed course will worsen my child's health condition	1 – 2 – 3 – 4 – 5
21	Not taking all antibiotics prescribed by the doctors may aggravate the disease	1 – 2 – 3 – 4 – 5
22	The use of antibiotics without a prescription leads to my child's kidney damaged	1 – 2 – 3 – 4 – 5
Perceived self-efficacy		
23	I always try to make my child take antibiotics as prescribed by the doctor	1 – 2 – 3 – 4 – 5
24	I am not sure my child will recover eventhough she/he finish the antibiotics as prescribed by the doctor	1 – 2 – 3 – 4 – 5
25	I am sure my child is recovering quickly because of taking antibiotics	1 – 2 – 3 – 4 – 5
26	I need to find additional information about the antibiotics my doctor prescribes for my child	1 – 2 – 3 – 4 – 5
27	I clarified to the doctor / pharmacist about the antibiotics given to my child	1 – 2 – 3 – 4 – 5
28	I'm not sure my child needs to take all the antibiotics prescribed by the doctor	1 – 2 – 3 – 4 – 5
29	Finishing antibiotics is easy for my child	1 – 2 – 3 – 4 – 5
30	I always try not to buy antibiotics without a doctor's prescription	1 – 2 – 3 – 4 – 5

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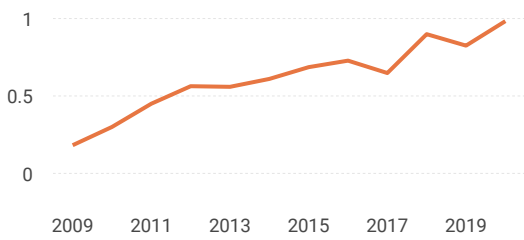
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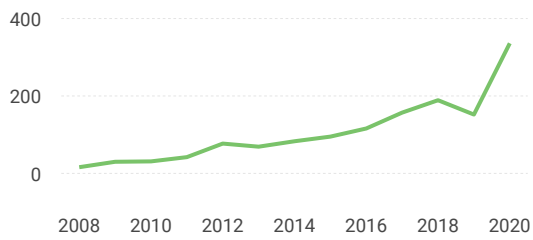
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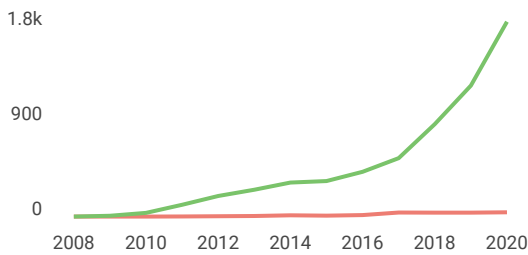
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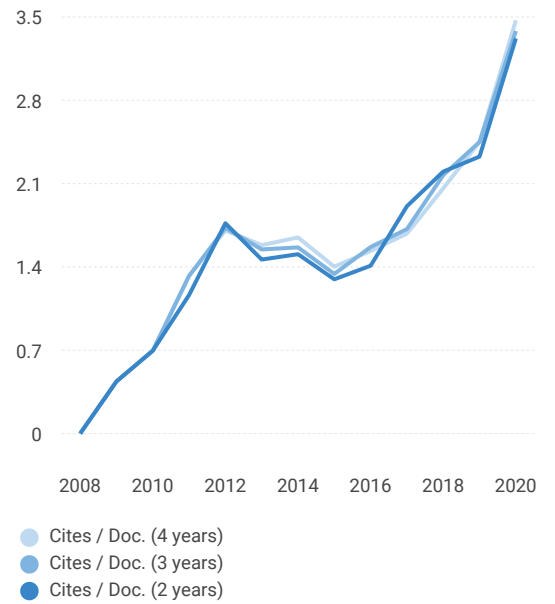
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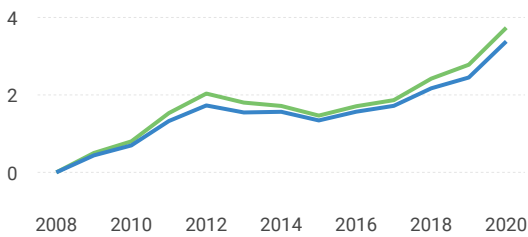
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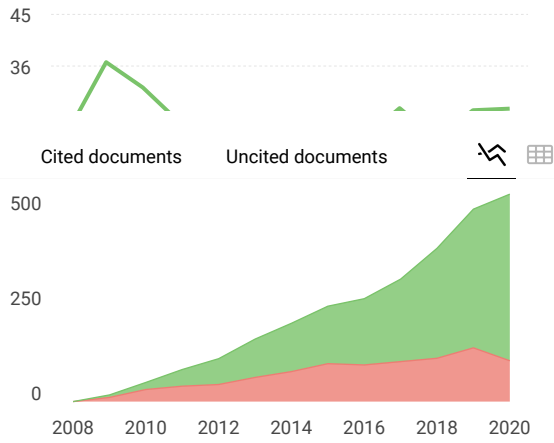
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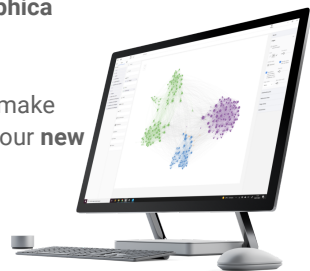
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For Your efforts and advise we thank You very much in advance.

Best regards
Michael Holbach

PS: the text has not yet been supervised linguistically, so we apologize for errors in the English language at the present stand.

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