

**UNIVERSIDADE DE BRASÍLIA FACULDADE DE CIÊNCIAS DA SAÚDE
DEPARTAMENTO DE ENFERMAGEM PROGRAMA DE PÓS-
GRADUAÇÃO EM ENFERMAGEM**

RAFAELLY STAVALE

**INTEGRIDADE CIENTÍFICA NAS CIÊNCIAS DA SAÚDE E DA VIDA EM
DIFERENTES CONTEXTOS**

**BRASÍLIA
2022**

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Dissertação apresentada como requisito parcial para a obtenção do Título de Mestre em Enfermagem pelo Programa de Pós-Graduação em Enfermagem da Universidade de Brasília.

Área de Concentração: Cuidado, Gestão e Tecnologias em Saúde e Enfermagem

Linha de Pesquisa: Gestão dos Sistemas e de Serviços em Saúde e Enfermagem

Orientadora: Prof.^a Dr.^a Dirce Bellezi Guilhem (UnB)

**BRASÍLIA
2022**

FOLHA DE APROVAÇÃO

RAFAELLY STAVALE

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Aprovada em: ____ de _____ de _____.

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Dedico

A Simone M. Stavale, por me ensinar sobre resiliência e força para nunca desistir dos meus sonhos. Ao Reynaldo L. Stavale, por me ensinar sobre a serenidade precisa para enfrentar desafios do cotidiano. Ao Reynaldo L. Stavale Jr, por me ensinar sobre ter coragem e confiança para crescer sem ser convencional. As mulheres da Zâmbia por me ensinar sobre esperança e arte do cuidado.

AGRADECIMENTOS

Agradeço a Deus e ao Universo por me proporcionar uma família tão amada e que sempre me apoiou, até nos projetos menos convencionais. Minha eterna gratidão aos meus pais,

meu irmão, Maitê, Bernardinho, minha madrinha e ao tio Leozinho por sempre me apoiarem na minha jornada pelo crescimento pessoal e profissional.

Agradeço também as minhas amigas Karen, Camila, Anna Paula, Luiza, Ana Davids, Laurent, Livia, Vanjy pelas palavras de motivação, por compreenderem minhas ausências e acreditarem na minha capacidade, em alguns momentos, mais do que eu mesma.

Agradeço aos encontros que tive que me levaram a outro continente. À todas as pessoas que me ajudaram a realizar o sonho de ir para África como voluntária, que me ajudaram a abrir uma biblioteca na Zâmbia e a realizar tantas outras coisas. Agradeço às mulheres incríveis, enfermeiras que modificaram a minha trajetória e me colocaram na direção certa.

À minha orientadora e mentora pelo incentivo e apoio desde a graduação, que me acolheu, motivou, confiou no meu potencial e me ensinou tanto em diversos momentos dessa trajetória. Obrigada por investir em mim, por me apresentar uma área de pesquisa por qual me apaixonei e por ter uma liderança tão especial. Você é uma pessoa e profissional muito querida.

À Graziani que foi minha parceira durante essa jornada. Obrigada por me ensinar tanto, por me dar suporte, me ouvir nos momentos de desespero e nos momentos de sonhar com novos projetos de pesquisa!

À Universidade de Brasília por me proporcionar contato com tantas pessoas especiais em um ambiente tão diverso e consciente do papel social dos pesquisadores.

Ao Departamento de Enfermagem pelas inúmeras oportunidades, por financiar minha participação em eventos importantes da área e me permitir representar nosso grupo de pesquisa internacionalmente. À FAP/DF e à CAPES pelo financiamento do meu mestrado e pelo incentivo a pesquisa. Esse apoio faz muita diferença!

Agradeço aos colaboradores destes trabalhos, João Antônio Martins Galvão (Joni), e tantos outros que ainda não foram citados. Em especial, agradeço ao Danilo que me ajudou tanto na reta final deste trabalho com palavras de apoio e na coleta de dados. Não tenho palavras para agradecer você ter abraçado a minha pesquisa e me ajudado. Agradeço também as minhas amigas, chefes, mentoras Rita Simone e Francine por todo o suporte para que conseguisse concluir este trabalho.

Minha eterna gratidão às pessoas que cruzaram meu caminho e que de alguma forma me auxiliaram no processo de produção desta dissertação ou na divulgação deste tema de pesquisa, mas que por algum motivo não citei aqui. Obrigada!

TRAJETÓRIA PESSOAL E MOTIVAÇÃO PARA PESQUISA

Minha motivação profissional começou quando tinha entre 10 e 12 anos e sonhava em ir para a África ajudar as pessoas. Com o passar dos anos, o sonho se transformou no desejo de trabalhar na ONU, na vontade de ser antropóloga e advogar pelos menos favorecidos. E foi assim, que aos 19 anos, graduanda de Antropologia na Universidade de Brasília, fui fazer trabalho voluntário em uma ONG por um ano.

Trabalhei nos Estados Unidos angariando fundos para organização, com educação em saúde em Centros voltados para pessoas com HIV e me preparando para ficar seis meses na Zâmbia atuando em um programa de saúde voltado para DST's, AIDS e Tuberculose. Minha função era treinar as pessoas para realizar aconselhamento e testes rápidos de HIV1-2.

Na Zâmbia conheci muitos enfermeiros formados pela vida, pela força de vontade em buscar informações apesar de todas as dificuldades. Na época, não havia *smartphones* ou internet de fácil acesso, assim como, livros eram raros e bibliotecas...um sonho distante. Ainda assim, as enfermeiras da comunidade trocavam informações com viajantes, ou quando viajavam por outros países.

Conheci uma mulher, líder, enfermeira, que foi me apresentar sua maior conquista como conselheira do programa de DST-AIDS. A conquista: uma criança de 4 anos, de mãe soropositiva, que não apresentou complicações durante aleitamento materno ou faleceu de malária. A enfermeira, depois de me apresentar o binômio, me confessou que era a quinta tentativa daquela mãe de ter um filho. E acrescentou que foi em uma viagem para Tanzânia que achou um panfleto informativo sobre aleitamento materno e HIV. Ela me disse que aquela informação ajudou muitas pessoas da comunidade e que antes ela já havia testado várias outras medidas, sem sucesso.

Ficou claro a importância da informação de qualidade, da pesquisa e do fazer pesquisa, assim como, o impacto destas na vida das pessoas. Além disso, não poderia compreender melhor o papel da enfermagem se não fosse por essa experiência.

Digo que àquelas mulheres são enfermeiras porque elas testavam o conhecimento, buscavam fazer ciência, eram líderes da comunidade sem deixar de lado a arte do cuidado. E foi assim, nessa trajetória iniciada como aspirante a cientista social que terminei com o desejo de ser enfermeira. Existe profissão que mais advoga, de forma holística, pelos menos favorecidos? Talvez, mas como a enfermagem, não.

Ao voltar para o Brasil, com o apoio dos meus pais, fiz o vestibular e ingressei na Universidade de Brasília para o curso de Enfermagem. Durante a graduação busquei participar de projetos de extensão e pesquisa. Afinal, gostaria de ser enfermeira, educadora e pesquisadora levando para a minha vida profissional os ensinamentos de Darcy Ribeiro. Acredito, que a melhor forma de realizar este sonho seria seguindo carreira acadêmica mantendo contato com a assistência por meio de atividades de extensão.

Tive a oportunidade de fazer um curso de pesquisa clínica em Harvard e a partir desse momento, conversei sobre integridade de pesquisa na área da saúde com a professora Dirce. O tema era relativamente novo, mas o impacto das retratações e a necessidade de compreender melhor o fenômeno era evidente. Assim, comecei minha trajetória nesta área. Inicialmente, como aluna voluntária do Programa de Iniciação Científica (PROIC) 2016-2017 e posteriormente como bolsista de 2017-2018.

Durante o PROIC, juntamente com a professora Dirce, pude aprofundar meus conhecimentos em diferentes metodologias científicas e bioética. Nosso principal objetivo era investigar casos de má conduta no país, discutir o assunto, expor o seu impacto e a necessidade de avanços na temática para mitigar estes comportamentos.

Sabíamos que o desafio era grande e que nem todos iriam aprovar nosso tema de pesquisa. Ainda assim, persistimos, com cautela, objetividade e o máximo rigor. Depois de muito estudo, o PROIC deu fruto ao registro da minha primeira revisão sistemática.

Nosso maior desejo, meu e da minha mentora, era publicar nossos achados em uma revista internacional e ir para o *World Congress of Research Integrity*. E assim foi. Realizei o sonho de fazer uma pesquisa inovadora e que realmente causasse impacto.

Nesse processo já estava pensando no mestrado e em novas pesquisas. Logo, preparamos um projeto para dar continuidade a minha formação, assim que concluísse a graduação. Terminei a residência multiprofissional em cardiologia na UNIFESP, com o intuito de ter uma base prática e não entrar na academia sem experiência clínica.

No decorrer do mestrado e da residência ocorreu a pandemia por COVID-19 que modificou planos e oportunidades de docência/pesquisa e exigiu que me afastasse do mestrado. Ainda assim, como enfermeira de Unidade de Terapia Intensiva de pacientes com COVID-19 (Hospital São Paulo, Hospital de Clínicas de São Bernardo e Hospital Sírio Libanês) encontrei apoio para realizar pesquisa apesar da sobrecarga de trabalho e emocional.

Atualmente, trabalho como enfermeira no Hospital Sírio Libanês, nas Unidades Críticas, dou aulas particulares de metodologia de pesquisa e escrita de artigos. Durante

a pandemia por COVID-19, a docência e a pesquisa ficaram em segundo plano. Após três anos, é uma enorme alegria estar de volta ao meio acadêmico e encerrar o ciclo do mestrado para começar um novo. Sigo em busca do sonho de ser uma profissional mais completa, que auxilia na formação de futuros profissionais e no cuidado das pessoas.

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STAVALE, Rafaelly. Integridade científica e COVID-19: análise e compreensão das retratações de artigos científicos em diferentes cenários. Dissertação (Mestrado) - Departamento de Enfermagem, Faculdade de Ciências da Saúde, Universidade de Brasília, Brasília, DF, 2022.

RESUMO

Introdução. Estudos sobre as principais práticas de má conduta científica, são crescentes devido ao seu impacto socioeconômico e científico, principalmente durante uma crise de saúde pública global – Pandemia por COVID-19. A retratação de artigos afeta objetividade, qualidade, confiabilidade e veracidade de trabalhos científicos. **Objetivo.** O principal objetivo deste estudo foi compreender a prática de valores e princípios da integridade científica antes e após o surgimento da pandemia por COVID-19. **Metodologia.** Trata-se de dissertação composta por quatro estudos: uma revisão sistemática registrada no PROSPERO que avaliou as publicações de ciências da saúde e vida retratadas; uma revisão de políticas e práticas; um capítulo de livro e uma revisão sistemática de artigos retratados sobre a COVID-19. **Resultados.** Serão apresentados por meio de quatro estudos produzidos no decorrer do mestrado. Os resultados demonstraram que a principal causa de retratação de autores afiliados a universidades brasileiras é alguma forma de má conduta científica. Quinze instituições, com retratações, foram analisadas quanto a disponibilidade de guias práticos para integridade de pesquisa: cinco agências de fomento a pesquisa e dez universidades. Trinta por cento das instituições não possuíam nenhum guia disponível publicamente. No contexto do COVID-19, 225 artigos foram analisados. Os principais motivos de retratação foram duplicação de artigos e não aprovação pelo comitê de ética. Observou-se que as retratações não seguiam as recomendações do COPE em ambas as revisões sistemáticas, implicando na falta de transparência de informações. **Conclusões:** Práticas que ferem a integridade científica comprometem a confiabilidade e a qualidade do conhecimento científico. A má conduta científica foi a principal causa de retratação de artigos nas ciências da saúde e vida no contexto de autores filiados a instituições brasileiras e de publicações durante a pandemia por COVID-19. Além disso, as instituições brasileiras precisam desenvolver mais ferramentas para promover a cultura da integridade e boas práticas científicas e mitigar a má conduta no cotidiano do desenvolvimento de pesquisas e divulgação dos resultados.

Palavras-chave: Integridade de pesquisa; bioética; retratação de publicação; má conduta

STAVALE, Rafaelly. Scientific integrity and COVID-19: analysis and understanding of retractions of scientific articles in different scenarios. Thesis (Master's degree) – Department of Nursing, Faculty of Health Sciences, Universidade de Brasília, Brasília, DF, 2022

ABSTRACT

Introduction: Studies on the main scientific misconduct practices are growing due to their socioeconomic and scientific impact, especially during a global public health crisis – the COVID-19 Pandemic. The retraction of articles affects objectivity, quality, reliability and veracity of scientific works. **Objective:** The main objective of this study was to understand the practice of values and principles of scientific integrity before and after the COVID-19 pandemic. **Methodology:** It is a dissertation composed of four studies: a systematic review registered in PROSPERO that evaluated the health and life sciences publications portrayed; a review of policies and practices; a book chapter and a systematic review of featured articles on COVID-19. **Results:** They will be presented through four studies produced during the master's degree. The results showed that the

main cause of retraction of authors affiliated to Brazilian universities is some form of scientific misconduct. Fifteen institutions, with retractions, were analyzed for the availability of practical guides for research integrity: five research funding agencies and ten universities. Thirty percent of institutions had no publicly available guide. In the context of COVID-19, 225 articles were analyzed. The main reasons for retraction were duplication of articles and non-approval by the ethics committee. It was observed that the retractions did not follow the COPE recommendations in both systematic reviews, implying a lack of information transparency. **Conclusions:** Practices that harm scientific integrity compromise the reliability and quality of scientific knowledge. Scientific misconduct was the main cause of retraction of articles in the health and life sciences in the context of authors affiliated with Brazilian institutions and publications during the COVID-19 pandemic. In addition, Brazilian institutions need to develop more tools to promote a culture of integrity and good scientific practices and to mitigate misconduct in the daily development of research and dissemination of results. **Keywords:** Research integrity; bioethics; publication retraction; research misconduct STAVALE, Rafaelly. Integridad científica y COVID-19: análisis y comprensión de retractaciones de artículos científicos en diferentes escenarios. Tesis (Maestría) – Departamento de Enfermería, Facultad de Ciencias de la Salud, Universidade de Brasília, Brasília, DF, 2022

RESUMÉN

Introdución: Los estudios sobre las principales prácticas de mala conducta científica están aumentando debido a su impacto socioeconómico y científico, especialmente durante una crisis de salud pública mundial: la pandemia de COVID-19. La retractación de artículos afecta la objetividad, calidad, confiabilidad y veracidad de los trabajos científicos. **Objetivo:** El objetivo principal de este estudio fue comprender la práctica de los valores y principios de la integridad científica antes y después de la pandemia de COVID-19. Metodología. Es una disertación compuesta por cuatro estudios: una revisión sistemática registrada en PROSPERO que evaluó las publicaciones de ciencias de la salud y de la vida retratadas; una revisión de políticas y prácticas; un capítulo de libro y una revisión sistemática de artículos destacados sobre COVID-19. **Resultados:** Se presentarán a través de cuatro estudios elaborados durante el máster. Los resultados mostraron que la principal causa de retractación de autores afiliados a universidades brasileñas es alguna forma de mala conducta científica. Se analizó la disponibilidad de guías prácticas para la integridad de la investigación en quince instituciones, con retractaciones: cinco agencias de financiación de la investigación y diez universidades. El 30% de las instituciones no tenían una guía disponible públicamente. En el contexto de la COVID-19 se analizaron 225 artículos. Los principales motivos de retractación fueron la duplicación de artículos y la no aprobación por parte del comité de ética. Se observó que las retractaciones no siguieron las recomendaciones de la COPE en ambas revisiones sistemáticas, lo que implica una falta de transparencia de la información. **Conclusiones:** Las prácticas que socavan la integridad científica comprometen la confiabilidad y calidad del conocimiento científico. La mala conducta científica fue la principal causa de retracción de artículos en las áreas de salud y ciencias de la vida en el contexto de autores afiliados a instituciones y publicaciones brasileñas durante la pandemia de COVID-19. Además, las instituciones brasileñas necesitan desarrollar más herramientas para promover una cultura de integridad y buenas prácticas científicas y mitigar las malas conductas en el desarrollo diario de la investigación y la difusión de los resultados.

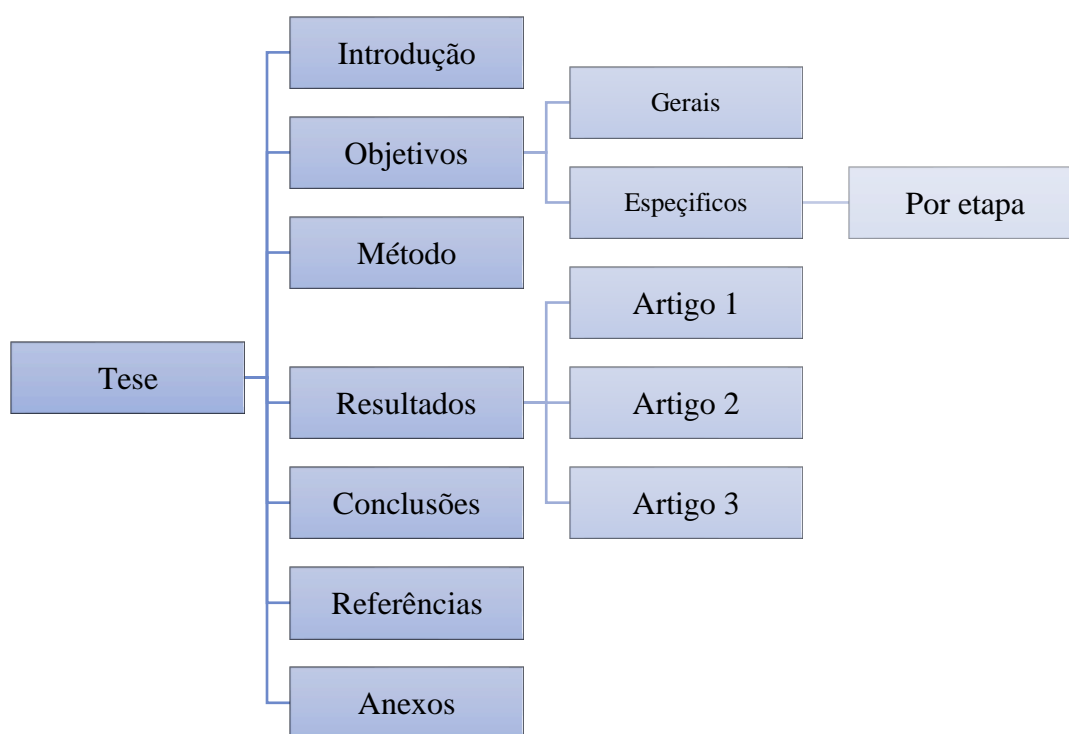
Palavra clave: Integridad de la investigación; bioética; retractación de publicación; mala conducta

ORGANOGRAMA DE APRESENTAÇÃO DA TESE

ORGANOGRAMA DE APRESENTAÇÃO DA TESE

A figura abaixo (Figura 1) apresenta o organograma estrutural do estudo realizado. Tem por objetivo descrever os componentes desta dissertação e demonstrar as relações entre as seções da pesquisa. Toda a estrutura aponta para o tema principal do estudo a integridade científica e sua associação com retratações de artigos da saúde/vida, guias e políticas voltadas para a temática disponível pelas instituições brasileiras. No esquema é possível observar a relação entre os objetivos e os artigos elaborados e que são apresentados nos resultados.

Figura 1 – Organograma de Apresentação da Dissertação.



Fonte: Elaborada pela autora

INTRODUÇÃO

INTRODUÇÃO

A integridade científica tem início na elaboração da pergunta de pesquisa e se estende à produção de artigo e publicação dos resultados (PORTNEY e colegas, 2007). Dessa forma, os princípios éticos devem ser respeitados durante todas as fases de investigação (BREEN et al, 2003). O planejamento de pesquisa que viola códigos éticos, o não cumprimento de protocolos durante a condução da pesquisa, a manipulação de dados, a não divulgação de resultados ou se sua divulgação inapropriada, disputas autorais, plágio ou autoplágio são condutas inadequadas que ferem a integridade na ciência.

Esse tema tem sido cada vez mais discutido no cenário internacional especialmente no que se refere a publicações que não seguem os requisitos exigidos para divulgação científica. Houve aumento exponencial na incidência de retrações das produções como consequência da maior atenção ao assunto combinada à falta de conduta apropriada pelos cientistas (FANG e colegas, 2012; VAN NOORDEN, 2011).

O que motiva cientistas a violarem a integridade científica pode estar relacionada à demanda das filiações para a publicação de trabalhos, busca por status no meio acadêmico, compensação financeira, entre outros (BREEN et al, 2003). Apesar disso, a responsabilidade e a ética profissional não devem ser deixadas de lado. Estratégias para evitar violações da integridade científica consideram a participação dos autores, pesquisadores, filiações, revistas e revisores. Medidas que devem ser tomadas em diversos âmbitos para identificar e evitar condutas inapropriadas.

A identificação de artigos retratados e os motivos que levaram à sua despublicação, auxilia outros pesquisadores quanto a cautela necessária para utilizar dados destes artigos como evidência (VAN NOORDEN, 2011). Artigos retratados não devem ser citados na literatura científica ou utilizados como evidência para novas pesquisas (VAN NOORDEN, 2011). Contudo, ainda se utilizam informações de publicações após terem sido retratadas (BAR-ILAN, 2018). Isso é preocupante, pois um artigo retratado compromete diversas outras produções que o citarem como evidência. Além disso, a produção científica afeta a prática profissional, que quando baseada em

trabalhos retratados, pode colocar em risco a saúde da população em geral. Dessa forma, existe preocupação importante quanto à produção científica e as condutas em saúde realizadas no período entre a publicação de um artigo e sua retratação.

A publicação de retratações esteve presente em diversos contextos, sendo que na pandemia por COVID-19, o impacto de pesquisas não confiáveis na prática baseada em evidência, na criação de políticas públicas e no desenvolvimento de novas pesquisas ficou mais evidente. Principalmente, pela necessidade de produção científica, publicação de resultados e tomada de decisão rápida.

Considerando a relevância do assunto, pretende-se com essa dissertação realizar estudos para compreender as principais causas de retratações de autores filiados a instituições brasileiras da área da Saúde/Vida, mapear as instituições envolvidas em retratações e a existência de guias de integridade científica, avaliar as retratações de artigos em uma situação de emergência de saúde pública com a pandemia por COVID-19.

A compreensão da forma de má conduta em pesquisa pode compartilhar luz sobre pontos fracos e pontos fortes de fatores individuais, organizacionais e estruturais para a implementação da cultura de integridade em pesquisa. Esta dissertação é composta por uma revisão sistemática registrada no PROSPERO de publicações retraídas em saúde e ciências da vida seguida de uma revisão de políticas e uma revisão sistemática de artigos retratados sobre a COVID-19. A defesa tratará dos resultados e discussões provenientes das produções realizadas durante o período do mestrado.

REFERENCIAL TEÓRICO

REFERENCIAL TEÓRICO

O *papel* da ciência

A pesquisa científica é essencial para o desenvolvimento do conhecimento (SORENSEN e colegas, 2021). As universidades e outras organizações executoras de pesquisa são o berço do conhecimento, desempenhando um papel fundamental na sociedade ao orientar a tomada de decisões sociais, políticas e econômicas provendo as informações necessários (SORENSEN e colegas, 2021). Dessa forma, a autoridade e relevância social da pesquisa depende da confiabilidade, validade e generalidade dos seus resultados. No entanto, a ciência é falível, varia contextualmente e nunca é irrefutável (SHAPIN, 2010). Seu progresso ocorre por meio do aprendizado com os seus erros e questionamentos de suas próprias hipóteses, ou seja, a própria ciência é fonte de incertezas, dilemas e paradócos (BECK, 1992).

É fundamental que a comunidade científica e o público confiem nos pesquisadores, em suas organizações, no processo de desenvolvimento de conhecimento sabendo que possuem integridade em científica (IC) definida por pesquisadores europeus como “a atitude e o hábito dos pesquisadores de conduzir suas pesquisas de acordo com princípios éticos legal e profissional, estruturas, obrigações e normas ” (ENERI, 2019; SORENSEN e colegas, 2021). Assim, a IC está relacionada com o *papel* dos cientistas e das instituições envolvidas com pesquisa.

A história da integridade científica está atrelada ao desenvolvimento da bioética e da consolidação da ciência em um sistema complexo composto pela sociedade como um todo, instituições privadas e públicas de fomento, sociedades/conselhos profissionais, periódicos científicos, mídia, empregadores (empresas, universidades) e etc (NATIONAL ACADEMIES OF SCIENCES ENGINEERING AND MEDICINE, 2017). Debates sobre os aspectos que envolvem o desenvolvimento do conhecimento científico de forma sistemática, empírica, objetiva, através da pesquisa está presente desde os filósofos da ciência, no século XVII. Contudo, discussões sobre qual o *papel* do

cientista em relação a outros iniciaram a partir da ética filosófica moderna e continuam até o presente (MITCHAN, 2003).

Como *papel*, entende-se o (s) comportamento(s) esperado(s) de um ocupante de determinada posição ou status (MITCHAN, 2003). Na década de 40, o sociólogo Robert Merton argumentou que os valores e normas da ciência moderna podem ser inferidos das práticas comuns e aceitas (MERTON,1970). Neste contexto, Merton propõe quatro normas ou valores para guiar o *papel* dos cientistas: universalismo, comunidade, desinteresse e ceticismo organizado (MERTON,1970).

O *universalismo* pressupõe que as afirmações científicas devem ser impessoais, objetivas. Isso não significa que o cientista não tenha motivação pessoal em relação ao seu objeto de estudo. A *comunidade*, se refere às descobertas da ciência serem propriedade comum à comunidade científica e que o progresso científico depende de comunicação e compartilhamento aberto. Para isso, a divulgação de resultados de estudos não deve ser precipitada para evitar equívocos. O *desinteresse*, determina que os interesses pessoais e de poder são um viés que deve ser limitado. Merton faz menção a competitividade e ao impacto negativo desta para ciência. O *ceticismo organizado* exige que para a ciência ser confiável e válida é preciso uma revisão por pares e reprodutibilidade dos resultados (MERTON,1970).

A pesquisa sobre cientistas e organizações científicas levou a uma melhor compreensão da existência de contranormas que entram em conflito com as normas propostas por Merton mas que são reconhecidas como parte da prática real da ciência (DEVEREAUX,2014; NATIONAL ACADEMIES OF SCIENCES ENGINEERING AND MEDICINE, 2017). Por exemplo, a lacuna entre as normativas ideais à ciência e o sistema de recompensa de suas instituições.

Um novo debate sobre o *papel* dos cientistas surgiu em 1970, com o conhecimento público do estudo de Sífilis Não Tratada de Tuskegee, conduzido pelo Serviço de Saúde pública dos Estados Unidos (*US Public Health Service*) (GUILHEM; DINIZ, 2008) . O estudo foi realizado entre 1932-1972, sem consentimento dos participantes e sem informá-los do diagnóstico de sífilis de forma clara. Além disso, o tratamento efetivo para doença foi descoberto no decorrer da pesquisa, mas não foi ofertado para nenhum dos

participantes, causando morte evitável de centenas de pessoas. Este caso ficou conhecido por ser um exemplo de má prática científica.

A divulgação do Caso de Tuskegee, trouxe à tona os abusos praticados em prol da ciência e de seu progresso chamando atenção de políticos, jornalistas, e da população geral (DIRCE, DINIZ 2008). O escândalo levou a criação da *National Commission of the Protection of Human Subjects of Biomedical and Behavioral Research*. Em 1979, a comissão criou o Relatório de Belmont que define o papel dos cientistas ao estabelecer os seguintes princípios éticos básicos da pesquisa com seres humanos: respeito as pessoas, beneficência e justiça (NATIONAL COMMISSION FOR THE PROTECTION OF HUMAN SUBJECTS OF BIOMEDICAL AND BEHAVIORAL RESEARCH, 1978; GUILHEM; DINIZ 2008; HORNER; MINIFIEF, 2011).

Em 2003, Mitchan realizou uma pesquisa em que demonstrou que o termo *integridade científica* não foi abordado pela filosofia diretamente, e portanto, não estava presente na Enciclopédia de Filosofia – Suplemento, Enciclopédia de Ética Aplicada ou na Routledge Enciclopédia de Filosofia (MITCHAN, 2003). Apesar da criação de documentos formais para definir princípios éticos da pesquisa com seres humanos, a *integridade científica* não foi tema de preocupação até os anos de 1980 (National Commission for the Protection of Human Subjects of Biomedical and Behavioral Research, 1978; GUILHEM; DINIZ 2002; HORNER; MINIFIEF, 2011; RUSSO,2014). Neste período, casos de fraude e má conduta de pesquisadores filiados a instituições renomadas foram divulgadas nas mídias. Surgiram questionamentos sobre o uso inadequado de dinheiro público por cientistas (MITCHAN,2003). O aumento de casos de má conduta gerou uma inquietação social e política que culminou nas primeiras definições de má conduta científica, além de, os Estados Unidos exigir medidas para minimizar má conduta científica dos beneficiários de subsídios (RUSSO,2014; MITCHAN,2003).

Neste mesmo período começaram a ser publicados trabalhos questionando o impacto dos casos de fraude (RUSSO, 2014). No periódico da *Science*, Broad alertou que as proporções dos atos fraudulentos colocavam em risco o conhecimento científico e confiabilidade da sociedade na ciência (RUSSO,2014; BROAD, 1981). A divulgação desses fatos, contribuiu para mobilização de pesquisadores e instituições em âmbito

nacional e internacional com o objetivo de restringir condutas impróprias na prática científica. Este movimento foi liderado pelos Estados Unidos por meio da criação do *Office of Research Integrity* (ORI da sigla em inglês) em 1992, seguidos por países europeus e alcançando níveis globais (RUSSO, 2014; ORI, 2017).

Apesar dos esforços para promover uma cultura de integridade científica e boas práticas, um número alarmantemente de problemas relacionados à IC continua a ser reportado mundialmente (SORENSEN, 2021). Estes incluem casos de fraude e práticas de pesquisa questionáveis (STENECK, 2006; FANELLI, 2009; BOUTER e colegas, 2016; RAVN e SORENSEN, 2021), bem como problemas com a confiabilidade dos resultados científicos (IONNIDIS 2005; RESNIK e SHAMOO, 2017; BAKER, 2016).

Por fim, violações das boas práticas de pesquisa enfraquecem a confiança do público e da comunidade de pesquisa na ciência, em suas instituições e em seus profissionais (ROBERTS e colegas., 2020; EDWARDS e ROY, 2017). Portanto, por questões de validade e confiança a integridade científica deve ser tema de atenção entre pesquisadores e instituições de pesquisa (BOUTER e colegas., 2016).

Integridade científica no Brasil

No Brasil, foi criado o processo de revisão ética a partir da criação do Sistema CEP-CONEP em 1996 (CNS, 2017). A criação de guias e diretrizes voltados para a integridade científica forma inicialmente realizadas pelas instituições de fomento e periódicos (PADUA;GUILHEM, 2015).

O ano de 2010, representou um marco no país para reflexão da integridade científica por meio do Primeiro Encontro Brasileiro de Integridade Científica e Publicação Ética (I BRISPE). A iniciativa foi resultado de um projeto de pós-doutorado da Universidade Federal do Rio de Janeiro com o propósito de estimular o envolvimento da comunidade científica em boas práticas com base nos princípios e valores da IC. Encontros subsequentes foram realizados a cada dois anos, sendo o último no ano de 2021 (VI BRISPE).

A partir deste evento, universidades e instituições de fomento passaram a divulgar guias de boas práticas científica com enfoque na IC. Em 2011 a FAPESP publicou o

Código de Boas Práticas Científicas, versões em espanhol e inglês foram disponibilizadas no ano seguinte. Em 2013, a Portaria 05/2013 regulamentou a divulgação de casos de má conduta apurados pela FAPESP, além de incluir uma cláusula de boas práticas, ou seja, de adesão a IC, nos acordos e convênios com empresas privadas. A Revista Pesquisa da FAPESP possui uma coluna de ética voltada para boas práticas de pesquisa e assuntos relacionados a IC. Sendo a mais recente publicação sobre a participação de diversos pesquisadores brasileiros no evento internacional de integridade científica (World Congress of Research Integrity).

A definição de integridade científica está em constante construção, uma vez que a própria ciência é mutável. Comportamentos entendidos como inaceitáveis atualmente, poderiam ser tidos como aceitáveis por pesquisadores no passado, ao passo que no futuro os valores atuais de IC podem não ser mais aceitáveis (RUSSO, 2014; MITCHAN, 2003). Atualmente, Guilhem definiu a IC como “(...) a adesão ativa a princípios éticos e padrões profissionais considerados essenciais para a prática científica responsável. Implica na adoção de princípios, valores e práticas incorporadas no processo de capacitação pessoal e profissional e não apenas uma aceitação passiva de regras consideradas impositivas. Nesse contexto, princípios éticos podem ser compreendidos como honestidade, veracidade e confiabilidade em todo o processo de condução e disseminação das pesquisas” (GUILHEM, 2017).

Definições de má conduta científica

Compreende-se por má conduta em pesquisa a fabricação, o plágio e a falsificação de dados, imagens ou relatos (THE OFFICE OF RESEARCH INTEGRITY, 2016; ALLEA, 2017). Estas ações comprometem a reprodutibilidade e a confiabilidade das produções científicas (WAGER E et al, 2009) . Contudo, considera-se que comportamentos que comprometem a validade e confiabilidade de pesquisas envolvem um sistema dinâmico e complexo com diversos atores (PUPOVAC et al, 2015; FELAEFEL et al, 2018). Práticas não alinhadas com a objetividade, transparência durante todo o processo de pesquisa incluindo divulgação de resultados; o uso adequado de referências; credibilidade justa a autores; e a responsabilização por futuras investigações científicas ferem a integridade científica. Apesar de não fazerem parte da tríade

fabricação, falsificação e plágio (FFP), estes comportamentos são considerados inapropriados.

Estudos que avaliam as implicações sociais e econômicas de práticas que ferem a integridade científica são cada vez mais desenvolvidos internacionalmente (SMITH et al, 2000; STEEN et al, 2011; BAKKER et al, 2018). Atualmente as discussões sobre integridade científica em âmbito nacional e internacional fomentaram a busca por medidas preventivas de má conduta, por meio de treinamento, mentoria, incentivo a pesquisa sobre o tema, desenvolvimento de instrumentos para orientar instituições e pesquisadores no desenvolvimento de suas pesquisas e criação de comissões e guias direcionados ao tema. Além disso, conferências globais e locais levam ao conscientização do tema e a elaboração de guias que são melhor aceitos pela comunidade científica (DEJO-VÁSQUEZ et al, 2021).

Impacto da má conduta científica nas Ciências da Saúde

Nas ciências da saúde/vida, práticas que ferem a IC são preocupantes pois causa impacto nas dimensões social, econômica e científica (STAVALE e colegas, 2019). Uma vez que a prática de saúde é baseada em evidência, o não respeito a IC, pode expor participantes de pesquisas e pacientes a tratamentos ou intervenções não confiáveis (STEEN, 2011). Estudos demonstraram que publicações retratadas por má conduta científica expuseram milhares de pacientes a tratamentos de eficácia questionável (STEEN, 2011). Socialmente, a má conduta científica fere a decisão médica correta, colocando em risco a saúde e a vida das pessoas. Adicionalmente, casos de má conduta podem minar a confiança pública na ciência e afetar a adesão a recomendações (SIMON e colegas, 2019; EASSON, 2016).

Estima-se -se que bilhões de dólares foram desperdiçados no financiamento de estudos baseados em publicações retratadas, ou seja, inválidas (NEIMARK, 2015). Cientificamente, novas investigações baseadas em achados não confiáveis e pesquisas antiéticas levam a conclusões não confiáveis, comprometendo o avanço do conhecimento científico (BAR-ILAN, 2017). Portanto, condutas de pesquisa corrompidas podem gerar uma cadeia de conhecimento questionável, mesmo que os estudos subsequentes sejam conduzidos segundo os princípios da IC.

No Brasil, existem poucas investigações para compreender o cenário da IC nas Ciências da Saúde, apesar do número de casos envolvendo fraude, plágio e retratações de artigos ser crescente (ALMEIDA e colegas, 2016). No contexto da enfermagem, o ano de 2004 marcou o primeiro artigo a ser retratado por plágio. Na publicação da retratação a autora admitiu má conduta científica (REICHENBACH, 2004).

Má conduta científica durante a pandemia por COVID-19

Durante a pandemia por COVID-19 um número crescente de pesquisas e publicações sobre o tema ocorreram, porém a qualidade e confiabilidades destas pesquisas foram questionadas a partir da primeira retratação de um artigo sobre tema (YINGCHUN ZENG e colegas, 2020; DINIS-OLIVEIRA, 2020). O melhor exemplo do impacto social, econômico e científico de publicações inválidas foi o artigo publicado no The Lancet sobre COVID-19 e que dois dias depois foi retratado.

Apesar da rapidez em que o trabalho foi retratado, o artigo recebeu 17 citações e influenciou a prática de saúde baseada em evidência em serviços de saúde de diversos países (MEHRA e colegas, 2020; BOSCHIERO e colegas, 2022). O mesmo, foi utilizado como base para criação de políticas públicas, foi divulgado nas mídias sociais e a medicação passou a ser recomendada sem ressalvas. Estudos subsequentes comprovaram que o medicamento não teria qualquer eficácia para o tratamento do COVID-19, além de aumentar o risco de morte intra-hospitalar, causar complicações cardíacas e hepáticas. em vez disso, foi encontrado um risco maior de arritmias ventriculares e maior risco de morte intra-hospitalar.

Mesmo após a retratação do estudo, sociedades profissionais, figuras públicas, políticos e diferentes mídias continuaram a divulgar o uso do medicamento por um período. No Brasil, hospitais mantiveram o medicamento como parte de protocolo de tratamento para o COVID-19, mesmo após a retratação do artigo e a divulgação dos novos resultados (BOSCHIERO e colegas, 2022). Neste caso, não houve apoio governamental ou adesão pública as recomendações da comunidade científica (BOSCHIERO e colegas, 2022).

Outro estudo, divulgou que medicamentos para o tratamento de insuficiência cardíaca poderiam favorecer a contaminação pelo vírus. O estudo foi retratado em menos

de uma semana, contudo nem todos os profissionais da saúde que estavam atuando na assistência tiveram acesso a retratação mantendo decisões clínicas erradas por um período.

Neste contexto, pretende-se fazer uma série de estudos para compreender impacto da não adesão aos valores e princípios da integridade científica pelas ciências da saúde/vida no contexto global – através da avaliação de artigos de COVID-19 -, e nacional – através de retratações de autores filiados a instituições brasileiras, assim como, pela análise de guias e políticas disponíveis.

OBJETIVOS

OBJETIVOS

Objetivo Geral

O objetivo principal do estudo foi compreender a prática de princípios e valores da integridade científica nas ciências da saúde/vida antes e após o surgimento da pandemia por COVID-19.

Objetivos Específicos

Os objetivos específicos de cada etapa estão ilustrados no fluxograma a seguir.

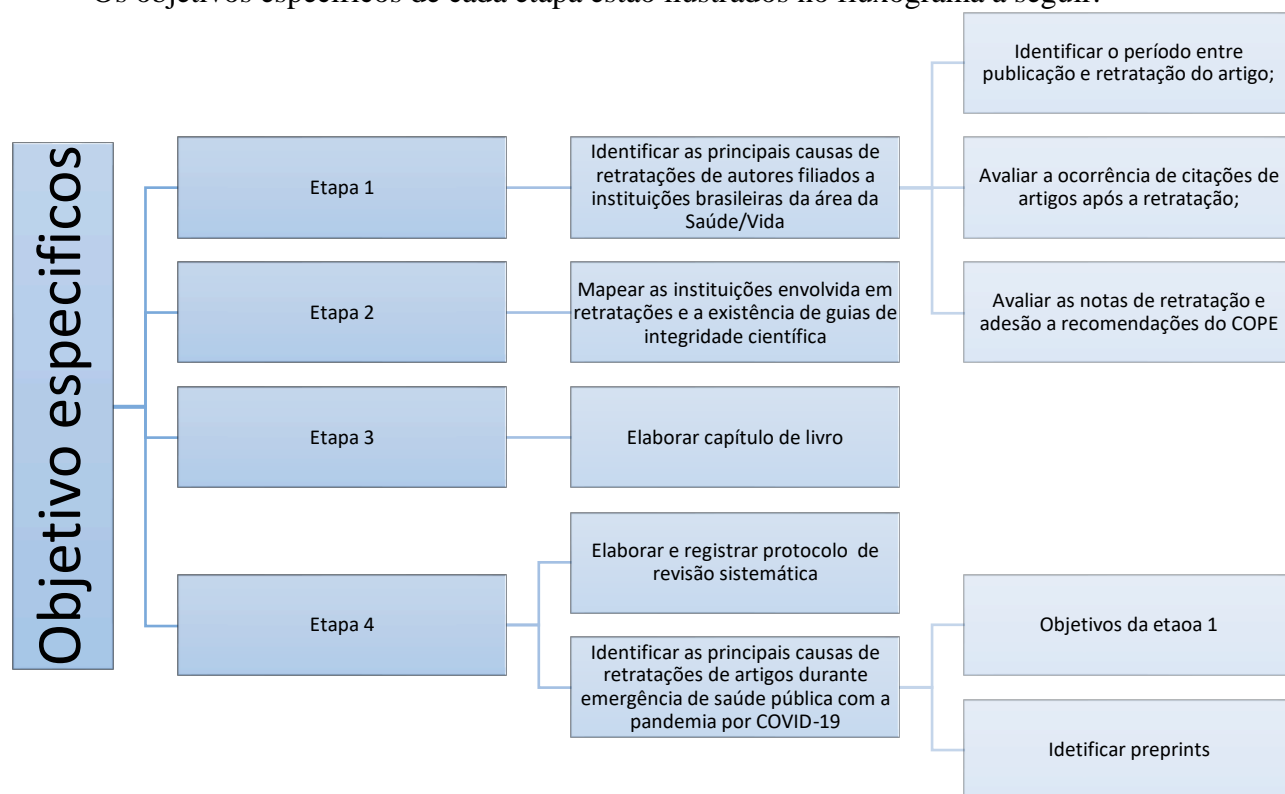


Figura 2 – Fluxograma dos objetivos da dissertação por etapa

Fonte: Elaborada pela autora



JUSTIFICATIVA

Este estudo se justifica pela gravidade do tema. Práticas de má conduta científica podem influenciar diretamente a tomada de decisões baseada em evidências, ensaios clínicos, a condução de novas pesquisas baseadas em estudos retratados e colocar em risco pessoas submetidas a intervenções não confiáveis, assim como, impactar protocolos institucionais e políticas públicas. Dessa forma, os fatores que ferem a integridade científica têm impacto importante nas práticas de saúde e da Enfermagem.

A primeira etapa deste estudo se justifica pela necessidade de se compreender quais as principais causas de retratações de artigos na área de ciências da saúde/vida publicados por autores filiados a instituições brasileiras. O estudo foi o primeiro a avaliar se as retratações se deram por má conduta científica ou por erros honestos.

A segunda etapa se justifica pela necessidade de identificar a existências de guias e comitês voltados para integridade científica em instituições brasileiras envolvidas com retratações. Este mapeamento identifica potencialidades e fragilidades das instituições brasileiras em relação ao tema.

A terceira etapa se justifica por colaborar com a disseminação de conceitos sobre integridade científica, regulações e responsabilidades em casos de má conduta, contexto brasileiro nas ciências da saúde e vida.

O aumento de produção científica sobre o COVID-19 foi acompanhado de uma série de casos de retratações. Dessa forma, a quarta etapa deste estudo se justifica pela necessidade de compreender quais são os aspectos que implicaram na não confiabilidade e validade de pesquisas sobre COVID-19, produzidas globalmente, durante a emergência sanitária.

Partindo disso, será possível sugerir ações para prevenção, mediação e punição destas práticas dentro da universidade. Consequentemente, este estudo contribuirá para o aumento da qualidade, confiabilidade e validade das futuras produções científicas.

Por fim, a análise completa dos aspectos que envolvem retratações em diferentes contextos, brasileiro e durante a pandemia por COVID-19, subsidiará autores, revisores,

editores, universidades, instituições de fomento a buscar estratégias para minimizar sua ocorrência, assim como, para dar suporte a cultura de integridade científica.

MÉTODOS

MÉTODO

A fim de responder aos objetivos do estudo proposto foram utilizados três tipos de delineamentos metodológicos (Quadro 1).

Quadro 1 – Relação entre delineamento metodológico utilizado e objetivos propostos, Brasília: 2022.

Objetivos	Tipo de metodologia
Identificar as principais causas de retratações de a instituições brasileiras da área da Saúde/Vida	Revisão Sistemática autores filiados
Mapear as instituições envolvida em retratações e a existência de guias de integridade científica;	Revisão de Políticas e Práticas
Identificar as principais causas de retratações de artigos durante emergência de saúde pública com a pandemia por COVID-19 Fonte: Elaborado pela autora.	Revisão Sistemática

O estudo foi realizado em três etapas (Figura 3). A Fundação de Amparo à Pesquisa do Distrito Federal – FAPDF (1629.018); Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - CAPES Brasil (1651856), Programa Especial de Pesquisa e Treinamento em Doenças Tropicais –TDR/OMS (B20359) financiou a primeira etapa da pesquisa, contando com a provisão de bolsa de estudo para equipe de pesquisadores envolvidos. O Programa de Pós-Graduação em Enfermagem – PPGENF proveu auxílio para divulgação de resultados no *World Congress of Research Integrity - 6th WCRI* na modalidade de apresentação oral. A segunda e a terceira etapa receberam amparo do *World Congress of Research Integrity Committee WCRI* para divulgação de resultados no 7th WCRI por meio de apresentação no formato poster e oral.



Figura 3 – Etapas de Desenvolvimento do Estudo, Brasília: 2022. **Fonte:** Elaborado pela autora.

Primeira Etapa

A primeira etapa da dissertação compreendeu a criação de protocolo de revisão sistemática, registro na PROSPERO e execução da revisão para identificar as principais causas de retratações de autores filiados a instituições brasileiras da área da Saúde/Vida. A revisão sistemática é um método sistematizado que, a partir de uma questão claramente formulada identifica, seleciona e avalia criticamente dados dos estudos incluídos na revisão (1). Os métodos utilizados devem ser reprodutíveis e transparentes, de forma que exige o registro prévio do protocolo em uma base de dados aberta (1). A revisão foi registrada na PROSPERO número: CRD42017071647.

A revisão sistemática de retratações possibilitou a identificação dos principais motivos envolvidos na retirada de artigos, afim de determinar se a principal causa estaria relacionada a má conduta científica ou a erros honestos. O estudo considerou como

ponto de partida o ano de 2004, marcado pela primeira retratação de artigo da Enfermagem (8).

A coleta de dados foi realizada por dois pesquisadores independentes. Em caso de empate, um terceiro revisor ficou responsável por avaliar a inclusão ou não do artigo na revisão. A busca inicial de artigos, a seleção de artigos e a coleta de dados foi realizada conforme preconizado no protocolo disponível na PROSPERO. A estratégia de busca está disponível em: https://www.crd.york.ac.uk/PROSPEROFILES/71647_STRATEGY_20170610.pdf.

Após, finalização da revisão, os resultados foram reportados por meio da publicação do Artigo 1: “*Research misconduct in health and life sciences research: A systematic review of retracted literature from Brazilian institutions*” na *Plos One* (9).

Segunda Etapa

A segunda etapa foi composta pela realização de uma revisão de políticas e práticas para compreender mapear as instituições envolvidas em retratações, identificadas na primeira etapa, e para identificar a existência de guias de integridade científica. Para tal, utilizou-se os resultados da etapa um para identificar quais instituições deveriam ser incluídas na revisão e buscou-se por informações disponíveis publicamente.

A revisão de políticas e práticas é um método utilizado para identificar, sintetizar e analisar criticamente políticas e práticas em determinada área de conhecimento. O intuito é auxiliar no desenvolvimento de conhecimento identificando pontos fortes e lacunas, além de correlacionar o problema identificado com a literatura. Para esta etapa utilizou-se como base publicações com essa metodologia e as recomendações da revista *Frontiers*.

Os resultados desta etapa foram aceitos para publicação (Anexo 1).

Terceira Etapa

Revisão narrativa da literatura para elaborar um capítulo de livro sobre integridade científica e má conduta científica nas ciências da saúde, no contexto brasileiro.

Quarta Etapa

A terceira etapa foi composta pela criação de protocolo de revisão sistemática, pré registrado na Open Science Framework e execução da revisão para identificar as principais causas de retratações de artigos da Saúde/Vida relacionados ao COVID-19. A

coleta de dados ocorreu no período de Abril a Maio de 2022 nas bases de dados Web of Science, PubMed, Scopus. Como literatura cinzenta foi utilizada a base de dados do blog Retraction Watch.

Ao final da análise dos dados e elaboração de manuscrito, o trabalho será enviado para publicação em periódico indexado.

RESULTADOS

RESULTADOS

Os resultados do presente estudo, composto por diversas metodologias está expresso neste capítulo em formato de artigos (Quadro 2), seguindo a formatação e idioma exigidos por cada uma das revistas sob a qual foram submetidos.

Quadro 2 – Relação entre Objetivo e resultado (artigos), Brasília: 2022.

Artigo

Fonte: Elaborado pela autora.

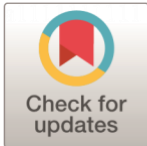
Artigo 1: “*Research misconduct in health and life sciences research: A systematic review of retracted literature from Brazilian institutions.*”

Objetivos

<p>Artigo 2: “<i>Research integrity guidelines in the academic environment: the context of institutions with retracted publications in health and life sciences in Brazil</i>”</p>	<ul style="list-style-type: none">• Caracterizar as causas subjacentes de retratação de artigos de saúde/vida de autores filiados a instituições brasileiras;• Avaliar a extensão de práticas de má conduta de pesquisa;• Apoiar discussões de possíveis soluções;• Avaliar se as notas de retratações seguem as recomendações do COPE;• Promover novas investigações.
<p>Artigo 3: “<i>Research misconduct in health and life sciences in Brazil</i>”.</p>	<ul style="list-style-type: none">• Mapear informações disponíveis de escritórios de integridade em pesquisa e diretrizes de instituições brasileiras envolvidas com publicações retratadas em saúde e ciências da vida;• Resumir as diretrizes e políticas disponíveis para integridade em pesquisa no país.
<p>Artigo 4: “<i>Retratação de artigos sobre COVID-19 na saúde: uma revisão sistemática</i>”.</p>	<ul style="list-style-type: none">• Elaborar capítulo de livro com conceitos de integridade científica e má conduta;• Discutir cenário brasileiro.
<p>38</p>	<ul style="list-style-type: none">• Elaborar e registrar protocolo de revisão sistemática;• Mapear as causas de retratação de artigos de saúde/vida sobre COVID-19;

- Avaliar a extensão de práticas de má conduta de pesquisa;
- Avaliar se as notas de retratações seguem as recomendações do COPE.
- Caracterizar artigos como preprints ou não;

ETAPA I



research: A systematic review of retracted literature from Brazilian institutions

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OPEN ACCESS

Citation: Stavale R, Ferreira GI, Galvão JAM, Zicker F, Novaes MRCG, Oliveira CMd, et al. (2019) Research misconduct in health and life sciences research: A systematic review of retracted literature from Brazilian institutions. PLoS ONE 14(4): e0214272. <https://doi.org/10.1371/journal.pone.0214272>

Editor: Angeliki Kerasidou, University of Oxford, UNITED KINGDOM

Received: June 22, 2018

Accepted: March 11, 2019

Published: April 15, 2019

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Data Availability Statement: All relevant data are within the manuscript and its Supporting Information files.

Funding: Researchers involved in this review were supported by a grant from the following agencies: the Federal District Research Foundation – FAPDF (1629 018); Coordination for the Improvement of Higher Education Personnel - CAPES Brazil (1651856), Special Programme for Research and training in Tropical Diseases –TDR/WHO (B20359), RESEARCH ARTICLE

Research misconduct in health and life sciences

Abstract

Background

Measures to ensure research integrity have been widely discussed due to the social, economic and scientific impact of research integrity. In the past few years, financial support for health research in emerging countries has steadily increased, resulting in a growing number of scientific publications. These achievements, however, have been accompanied by a rise in retracted publications followed by concerns about the quality and reliability of such publications.

Objective

This systematic review aimed to investigate the profile of medical and life sciences research retractions from authors affiliated with Brazilian academic institutions. The chronological trend between publication and retraction date, reasons for the retraction, citation of the article after the retraction, study design, and the number of retracted publications by author and affiliation were assessed. Additionally, the quality, availability and accessibility of data regarding retracted papers from the publishers are described.

Methods

Two independent reviewers searched for articles that had been retracted since 2004 via PubMed, Web of Science, Biblioteca Virtual em Saude (BVS) and Google Scholar databases. Indexed keywords from Medical Subject Headings (MeSH) and Descritores em Ciências da Saude (DeCS) in Portuguese, English or Spanish were used. Data were also collected from the Retraction Watch website (www.retractionwatch.com). This study was registered with the PROSPERO systematic review database (CRD42017071647).

UNIEURO, and the Brazilian National Council for Scientific and Technological Development – CNPq. These supporting institutions did not contribute to the study design, data collection or analysis, manuscript writing or publishing. JAMG is employed by Telecomunicacões do Brasil – Telebrás. Telecomunicacões do Brasil – Telebrás provided support in the form of salary for author JAMG, but did not have any additional role in the study design, data collection and analysis, decision to publish, or preparation of the manuscript. The specific role of this author is articulated in the ‘author contributions’ section.

Competing interests: JAMG is employed by Telecomunicacões do Brasil – Telebrás. There are no patents, products in development or marketed products to declare. This does not alter our adherence to all the PLOS ONE policies on sharing data and materials.

Results

A final sample of 65 articles was retrieved from 55 different journals with reported impact factors ranging from 0 to 32.86, with a median value of 4.40 and a mean of 4.69. The types of documents found were erratum (1), retracted articles (3), retracted articles with a retraction notice (5), retraction notices with erratum (3), and retraction notices (45). The assessment of the Retraction Watch website added 8 articles that were not identified by the search strategy using the bibliographic databases. The retracted publications covered a wide range of study designs. Experimental studies (40) and literature reviews (15) accounted for 84.6% of the retracted articles. Within the field of health and life

sciences, medical science was the field with the largest number of retractions (34), followed by biological sciences (17). Some articles were retracted for at least two distinct reasons (13). Among the retrieved articles, plagiarism was the main reason for retraction (60%). Missing data were found in 57% of the retraction notices, which was a limitation to this review. In addition, 63% of the articles were cited after their retraction.

Conclusion

Publications are not retracted solely for research misconduct but also for honest error. Nevertheless, considering authors affiliated with Brazilian institutions, this review concluded that most of the retracted health and life sciences publications were retracted due to research misconduct. Because the number of publications is the most valued indicator of scientific productivity for funding and career progression purposes, a systematic effort from the national research councils, funding agencies, universities and scientific journals is needed to avoid an escalating trend of research misconduct. More investigations are needed to comprehend the underlying factors of research misconduct and its increasing manifestation.

Introduction

Research integrity relies on rigorous methodological approaches during planning, conduct, documentation and reporting of studies [1]. Practices known to harm these steps are classified as research misconduct [2, 3]. It has become more common for studies addressing the impact of misconduct to be published as a warning to the scientific community [4, 5, 6]. In 2012, Fang and colleagues conducted a systematic review of retracted publications in the field of biomedical and life sciences using PubMed. Their findings showed that most of the retractions were due to fraud, and they addressed the impact of these findings since these studies are mainly publicly funded [4].

Research misconduct occurs when plagiarism, data manipulation, fabrication, poor study reporting, and lack of transparency are part of the scientific process [2]. These acts have been found to compromise the validity and reliability of research results [7, 8, 9]. On many occasions, these faults have led to a retraction notice. The publication of retraction notices intends to alert readers to serious errors—unintentional or of misconduct nature—that result in unreliable conclusions [7]. The purpose of retraction notices is also to avoid the use of these studies as a basis for future investigations, except for research about scientific integrity itself. Additionally, retractions are an important tool to evaluate scientific production, and the study of retractions supports measures to avoid error and misconduct.

Misconduct has scientific, social and economic impacts [5, 8, 10]. Economically, it has been estimated that billions of dollars have been wasted on funding studies based on retracted publications [11]. Socially, it affects evidence-based medicine by exposing study volunteers and the population as a whole to wrong medical decisions [10]. Scientifically,

further investigations based on unreliable findings and unethical research leads to untrustworthy conclusions, compromising the advances of scientific knowledge [9], [12], [13]. Therefore, corrupted research conducts may generate a chain of misconduct [6], [10].

Financial support for health and life sciences research has steadily increased in Brazil, which has been followed by a rising number of scientific publications. Simultaneously, there have been a growing number of retracted publications, raising concerns about the quality and reliability of these articles. The first retraction reported in health and life sciences from Brazilian institutions was a paper about nursing that was published in 2004 [14]. At the time, the author admitted to plagiarism. Since then, other cases of research misconduct have been discovered, generating apprehension about the scientific advances in the country.

Brazil is a member of the BRICS (Brazil, Russia, India, China, South Africa) cooperative group that is responsible for some of the 1% most cited publications in the world [15]. Although the citation impact of the country is below the global average, it increased 15% in the past six years [15]. The publications with higher impact ratings were performed mainly in collaboration with other institutions from the BRICS. The scientific influence of the country, as well as its participation in collaboration funds and networks for promoting health research, is growing worldwide [15].

The understanding of research integrity and research misconduct varies institutionally and culturally [16], [17], [18], so it is important to understand the factors underlying the retractions of Brazilian scientific publications and the notable increase in retractions.

Despite the relevance of research misconduct and the awareness of breaches of research integrity, the analysis of retracted publications in Brazil is quite new. In this context, this systematic review proposed the following research question: What are the main reasons for retracted publications in the field of health and life sciences that were published by researchers who are affiliated with Brazilian institutions? Answering this research question will pave the way for future investigations about research integrity in Brazil by recognizing the particularities of the country.

This review intended to characterize the underlying causes of retraction, to assess the extent of research misconduct, to support discussions of possible solutions, and ultimately, to promote further investigations. To carry out this review, data were collected regarding reasons for retraction, temporal trends from publication to retraction, citation pattern after retraction, and the impact factors and ethical guidelines endorsements of the journals. Additionally, this review evaluated the quality of retraction notices considering whether complete information was provided in accordance with the COPE guidelines [1]—a fundamental aspect of research transparency.

Materials and methods

Protocol and registration

This review protocol was registered with PROSPERO (CRD42017071647).

Information source

The screening of eligible publications was performed from late July to early August 2017 in accordance with the preapproved registered protocol.

Search strategy

Details of the search strategy are available via the following link:

https://www.crd.york.ac.uk/PROSPEROFILES/71647_STRATEGY_20170610.pdf.

Study selection

For this review, retraction notices that were published from January 2004 until August 2017 regarding articles that had at least one author that was affiliated with a Brazilian institution, irrespectively to their authorship position and regardless of the publication year of the original article, were selected. The start date was the publication year of the first retracted article in nursing science that was written by authors affiliated with a Brazilian institution [14].

Studies in the field of life and health sciences following the *Brazilian National Council for Scientific and Technological Development*, CNPq (from the Portuguese, Conselho Nacional de Desenvolvimento Científico e Tecnológico), classification [19] that were published in English, Portuguese or Spanish in national or international journals were eligible for this review.

Despite their study design, all retracted articles, with complete or incomplete retraction notice information according to the Committee of Publication Ethics (COPE) guidelines [2], were eligible for this review when they were in accordance with the protocol. Retraction notices, articles with a retraction notice attached or any sort of information indicating a retraction were considered for data collection. Studies regarding research integrity were excluded, as well as studies related to other fields of scientific knowledge.

Sampling and data collection process

Two independent reviewers searched for retracted articles via the PubMed, Web of Science and Brazilian Virtual Library of Health (BVS) databases. Google Scholar and the Retraction Watch [20] website were searched to identify additional publications and gray literature. The last database is an open access portal reporting retracted papers worldwide. The results were compared, and a consolidated list of retracted articles was produced according to the protocol.

Data were collected and analyzed according to reason for retraction, time trend from publication to retraction, citation pattern after retraction, journal impact factor, quality of retraction notice information, author's affiliation and adherence to either COPE or CONSORT guidelines on ethics and standard reporting.

Data collection rationale

1. **Publication year and retraction year trend:** The time between the date of publication and the date of retraction was calculated in years. Articles published and retracted in the same year were considered to have a time of 0. Publications without complete information regarding these dates were labeled as “not applicable” for this analysis.
2. **Author's affiliation:** This analysis was limited to one author per paper. Data were collected from the last authors because they are typically responsible for mentoring and

supervising the research planning, conduct and reporting [21]. Three articles were excluded from this analysis because the last author was not affiliated with a Brazilian institution.

3. **Journal's name and impact factor (IF):** The impact factor over the last 5 years was collected from Thompson and Reuters's indicators. Previous research has shown an increase in the citation of retracted papers when they were published in high impact journals [9]. This review investigated whether the same pattern exists in Brazilian publications.
4. **Ethical and reporting guidelines endorsement:** It was assumed that journals endorsed by either CONSORT or COPE guidelines followed ethical guidelines.
5. **Area of study:** The health and life sciences were categorized into the following sub groups: medical science, biological science, nutrition, dentistry, sports science, nursing science, physiotherapy, and pharmacology.
6. **Retraction indicator:** The presentation of retraction notices or retracted articles reflected how editors and databases did or did not facilitate their visibility. Transparency was ensured when retraction notices were attached to the original article and had a clear warning of retraction/withdrawal.
7. **Reasons for retraction:** The reasons for retraction were classified as a) error (inappropriate study design, data collection or report); b) fraud (data or image manipulation); c) author's dispute (publications without the consent or recognition of all authors, sponsors or industry manufacturers of the tested product); d) duplicated publication (when authors or editors published the same article more than once); e) irregular citation pattern or citation staking (artifice used to upgrade the impact factor of a journal); f) unknown (reason for retraction was not mentioned); g) plagiarism (image, text or unspecified forms of plagiarism) and; h) no informed consent was obtained for the use and publication of images of participants.
8. **Retracted by:** Retraction notices are expected to acknowledge who retracted the article. Retractions by authors indicate good faith and are considered as retractions due to an honest mistake. Retractions by editors, depending on the reason, may indicate honest mistakes from the editorial board or misconduct from the authors.
9. **Retraction endorsement by authors:** Authors usually participate and/or agree with the wording of the retraction. Report of participation of authors and their endorsement indicates transparency of the retraction process.
10. **Citation pattern of retracted articles:** The number of times an article has been cited reflects its visibility and possible impact on the scientific community [22]. Therefore, the citation pattern before and after retraction was analyzed by calculating the mean citations per year from the date of publication to the date of retraction for each article. Similarly, the mean citations per year from the date of retraction to 2017 were also calculated. For comparison purposes, articles with a higher mean number of citation per year before retraction were considered to have a *positive-citation pattern*, while those with a higher mean number of citations per year after retraction were considered to have a *negative-citation pattern*.

11. **Quality of retraction notices:** According to the COPE recommendations [2], [7], retraction notices must contain: the date of retraction, motives for the retraction, whether the retraction was endorsed by the authors, who requested the retraction, and the proper citation of the original article in the retraction notice. A complete report of this information accounts for a high-quality retraction notice.

Report

The PRISMA statement checklist was used to assure the quality of this systematic review. The checklist is provided as [S1 Table](#). Some topics did not apply for this study considering that this review evaluated only retraction notices and excluded the original articles. Consequently, the methods used to assess the risk of bias of the individual studies, summary measures, synthesis of results and risk of bias across studies was not used.

Statistical analysis

The Shapiro-Wilk normality test was conducted for the citation pattern before and after retraction and the correlation between the citation pattern and the impact factor of the journals. These variables exhibited a non normal distribution. Hence, the Spearman correlation test and a descriptive analysis were performed using the R statistical program version 3.4.2 and Excel for Mac 2011, version 14.4.3. [S1 File](#) of the conducted tests is available.

Results

Retraction notice selection

A final sample of 65 retracted articles was retrieved ([Fig 1](#)) from 55 different journals with an impact factor range of 0–32.86 and a mean impact factor of 4.7. The types of documents that were included were erratum (n = 1), retracted article (n = 3), retracted article with its retraction notice attached (n = 5), retraction notice with erratum (n = 3) and retraction notice (n = 45). The search using the Retraction Watch Blog [13] added 8 articles that were not identified by the search strategy using the bibliographic databases.

The retracted publications covered a wide range of studies. Experimental studies (n = 40) and literature reviews (n = 15) accounted for 84.6% of the included articles [Table 1](#). Studies conducted in the field of medical science accounted for 52% of the retrieved articles. Medical science was the field with the largest number of retractions (n = 34) followed by biological sciences at 26% (n = 17), dentistry 7.7% (n = 5), sports sciences at 3% (n = 2), pharmacology at 3% (n = 2), nutrition at 1.5% (n = 1), nursing sciences at 1.5% (n = 1), and physiotherapy at 1.5% (n = 1).

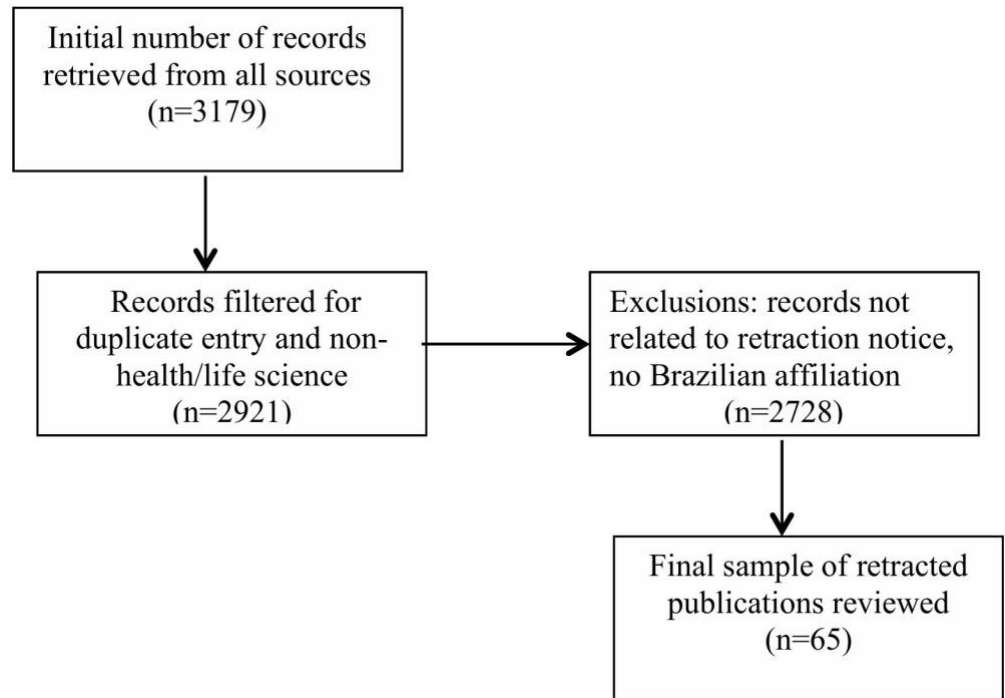


Fig 1. Flowchart of study identification and eligibility of retracted articles. Study selection flowchart showing initial number of records to final sample retrieved for analysis.

<https://doi.org/10.1371/journal.pone.0214272.g001>

Table 1. Type of study according to area of study.

Study type/area	N (%)
Experimental	40 (61.5%)
Medical Sciences	19
Biological Sciences	14
Dentistry	3
Sports Sciences	2
Physiotherapy	1
Nutrition	1
Literature review	15 (23.0%)
Medical Sciences	12
Pharmacology Sciences	2
Biological Sciences	1
Observational	6 (9.2%)
Biological Sciences	2
Medical Sciences	2
Nursing Sciences	1
Dentistry	1

Case study	2 (3.0%)
Nutrition	1
Dentistry	1
Meta-analysis	1 (1.5%)
Medical Sciences	1
Systematic review	1 (1.5%)
Medical Sciences	1
Total	65

<https://doi.org/10.1371/journal.pone.0214272.t001>

Ethical and standard reporting guidelines. Out of the 65 journals with published retracted notices, only 7 clearly complied with the COPE and CONSORT guidelines. A total of 41.5% of the selected journals were not member of COPE or part of CONSORT’s list. Still, reference to these two main ethical and reporting guidelines recommendations was found in the *Guide for Authors* section of these journals.

Affiliation, number of retractions and area of study of the authors. A total of 26 Brazilian institutions had at least one research article retracted. Of these institutions, 20 (77%) were public institutions, 5 (19%) were private institutions and 1 (4%) was a nonprofit organization. The University of São Paulo was the institution with the highest number of retracted publications (n = 17), followed by the University of Campinas (n = 16). Both are leading Brazilian academic institutions with the highest scientific productivity [15]. Of the 62 articles analyzed, 48 (77.4%) were published by authors affiliated with institutions located in southeastern Brazil. The University of Campinas (São Paulo) also accounted for the highest number of retractions by author Table 2. The largest number of postgraduate programs in the country is concentrated in the southeastern region of Brazil [23]. One author had 8 retractions during the studied period. Plagiarism was the main cause for retractions related to the two authors with most retractions that were affiliated with this university Table 3.

Time trend between publication and retraction. The time to retraction varied from 0 to 19 years. Five retraction notices (7.7%), 3 from 2011 and 2 from 2012, did not specify the year of retraction. In 2017, one article was retracted less than a year after it was published (Fig 2).

Table 2. Distribution of retracted publications by affiliation, author and area of study¹.

Brazilian Institution	Retracted Publication N (%) ²	Last Author	Number of Retracted Publications N
Universidade de São Paulo (USP)	17 (27.4%)	Gomes A	4
		Curi R	2
		Rocha e Silva M	2
		Santo D. S.	1
		Soares AM	1
		Marchini JS	1
		Pereira LV	1

		Oliveira MN.	1
		Miguel EC.	1
		SVerjovski-Almeida S	1
		Zuben CJV	1
		Mendonca MR	1
Universidade Estadual de Campinas (UNICAMP)	16 (25.8%)	Saad MJA	8
		Velloso LA	3
		Carvalho JBC	3
		Reis SF	1
		Franchini KG	1
Hospital Universita'rio Pedro Ernesto, Universidade Estadual do Rio de Janeiro (HUPE-UERJ)	2 (3.2%)	Gomes MB	2
Escola Bahiana de Medicina e Saude Pu'blica (BAHIANA)	2 (3.2%)	Ladeia AM	1
		Pazos RMA	1
Universidade Federal do Rio de Janeiro (UFRJ)	2 (3.2%)	Farias MLF de.	2
Universidade Federal do Triângulo Mineiro (UFTM)	2 (3.2%)	Etchebehere RM	1
		Patrizzi LJ	1
Universidade Federal do Parana' (UFPR)	2 (3.2%)	Reichembach MT	1
		Antoniuk SA	1
Faculdade de Ciências Me'dicas da Santa Casa de São Paulo	1 (1.6%)	Alli LAC	1
Faculdade de Medicina de Marília (FAMEMA)	1 (1.6%)	Stefano EJ	1
Heart Institute (INCOR)	1 (1.6%)	Hajjar LA	1
Hospital do Servidor Pu'blico Estadual de São Paulo (IAMSPE)	1 (1.6%)	Rotta JM	1
Hospital Israelita Albert Einstein	1 (1.6%)	Gamarra LF	1
Project "Avulsos Malacolo'gicos—AM"	1 (1.6%)	Agudo-Padron AI	1
Centro Universita'rio de Va'rzea Grande (UNIVAG)	1 (1.6%)	Ravagnani FCP	1
Universidade Federal da Fronteira Sul (UFFS)	1 (1.6%)	Mossi AJ	1
Universidade Federal de Pernambuco (UFPE)	1 (1.6%)	Rolim Neto, P.J.I	1
Universidade Federal de Viçosa (UFV)	1 (1.6%)	Silva VE	1
Universidade Federal do Maranhão (UFMA)	1 (1.6%)	Oliveira AE	1
Universidade Federal Rural do Semi'rido (UFERSA)	1 (1.6%)	Costa LLM	1
Universidade Paulista de Goiania (UNIP-Goiania)	1 (1.6%)	Botelho TL	1
Universidade Federal de Campina Grande (UFCG)	1 (1.6%)	Campos JHBC	1
Universidade do Vale do Itajaí (UNIVALE)	1 (1.6%)	Menezes JT	1
Universidade Estadual Paulista "Ju'lio de Mesquita Filho" (UNESP)	1 (1.6%)	Valenti VE	1
Universidade Federal da Bahia (UFBA)	1 (1.6%)	Portela RW	1
Universidade Estadual do Norte Fluminense (UENF)	1 (1.6%)	Gomes VM	1
Universidade de Brasí'lia (UnB)	1 (1.6%)	Teixeira ARL	1

(Continued)

Table 2. (Continued)

Brazilian Institution	Retracted Publication N (%) ²	Last Author	Number of Retracted Publications N
Total	62 (100%)	-	62

¹Specifically for this analysis, three articles were excluded because the last author was not affiliated with a Brazilian institution. These articles were considered for other analyses because they included authors who were affiliated with Brazilian institutions.

²The percentage presented considerate the sixty-two articles included for this analysis.

<https://doi.org/10.1371/journal.pone.0214272.t002>

The overall mean time to retraction was 3,36 years. Most articles (55%) took from one to three years from the time of publication to be retracted. Data showed the number of retracted articles increased significantly starting in 2012, the start point of this review.

Number of citations after retraction

The analysis of post retraction citations is a proxy assessment of the influence of articles on scientific activity despite of their retraction. A total of 37% of the retrieved articles had a *positive-citation pattern*; meanwhile, 63% had a *negative-citation pattern*. The most cited article with a *negative-citation-pattern* was published in 2007 and was retracted in 2016 [24]. Thus far, it has received a total of 490 citations and of these, 58 were from after the retraction of the article.

Association between impact factor and post retraction citation number

There was a strong positive correlation between the number of citations/year of an article after its retraction and the impact factor of the respective journal responsible for its retraction notice (Spearman rho = 0.69, p<0.05). The details of this analysis can be found in the [S1 File](#).

Table 3. Bibliographical references and reasons for retraction of the articles by the authors with the most retractions.

Author/institution	DOI	Journal	IF	Reason for retraction
Saad MJA UNICAMP	10.2337/diab.46.12.1950	Diabetes	8.512	Image Plagiarism
	10.2337/db06-1595	Diabetes	8.512	Image Plagiarism/ Fraud
	10.1590/S0004-27302009000200004	Arquivos Brasileiros de Endocrinologia e Metabologia	1.045	Plagiarism
	10.2337/db09-1907	Diabetes	8.512	Image Plagiarism
	10.1186/s13054-016-1453-8	Critical Care	5.406	Image Plagiarism
	10.1371/journal.pbio.1002479	PloS Biology	10.7	Image Plagiarism
	10.2337/db17-rt03a	Diabetes	8.512	Image Plagiarism
Gomes A USP	10.1371/journal.pone.0159283	PloS One	3.535	Plagiarism
	10.6061/clinics/2013(10)17	Clinics	1.444	Error
	10.1590/S1516-31802012000500009	São Paulo Medical Journal	0.893	Error

	2012;20(6):367–71	Acta Ortopédica Brasileira	0.384	Citation Stacking
	10.1590/S1807-59322011001100020	Clinics	1.444	Error
Velloso LA UNICAMP	10.1074/jbc.A110.173021	Journal of Biological Chemistry	4.403	Image Plagiarism
	10.1074/jbc.A111.315218	Journal of Biological Chemistry	4.403	Image Plagiarism
	10.1074/jbc.A109.030874	Journal of Biological Chemistry	4.403	Image Plagiarism
Carvalho JB UNICAMP	10.2337/db05-1622	Diabetes	8.512	Image Plagiarism
	10.2337/db17-rt03b	Diabetes	8.512	Image Plagiarism/ Fraud
	10.1053/j.gastro.2012.05.045	Gastroenterology	16.825	Image Plagiarism

<https://doi.org/10.1371/journal.pone.0214272.t003>

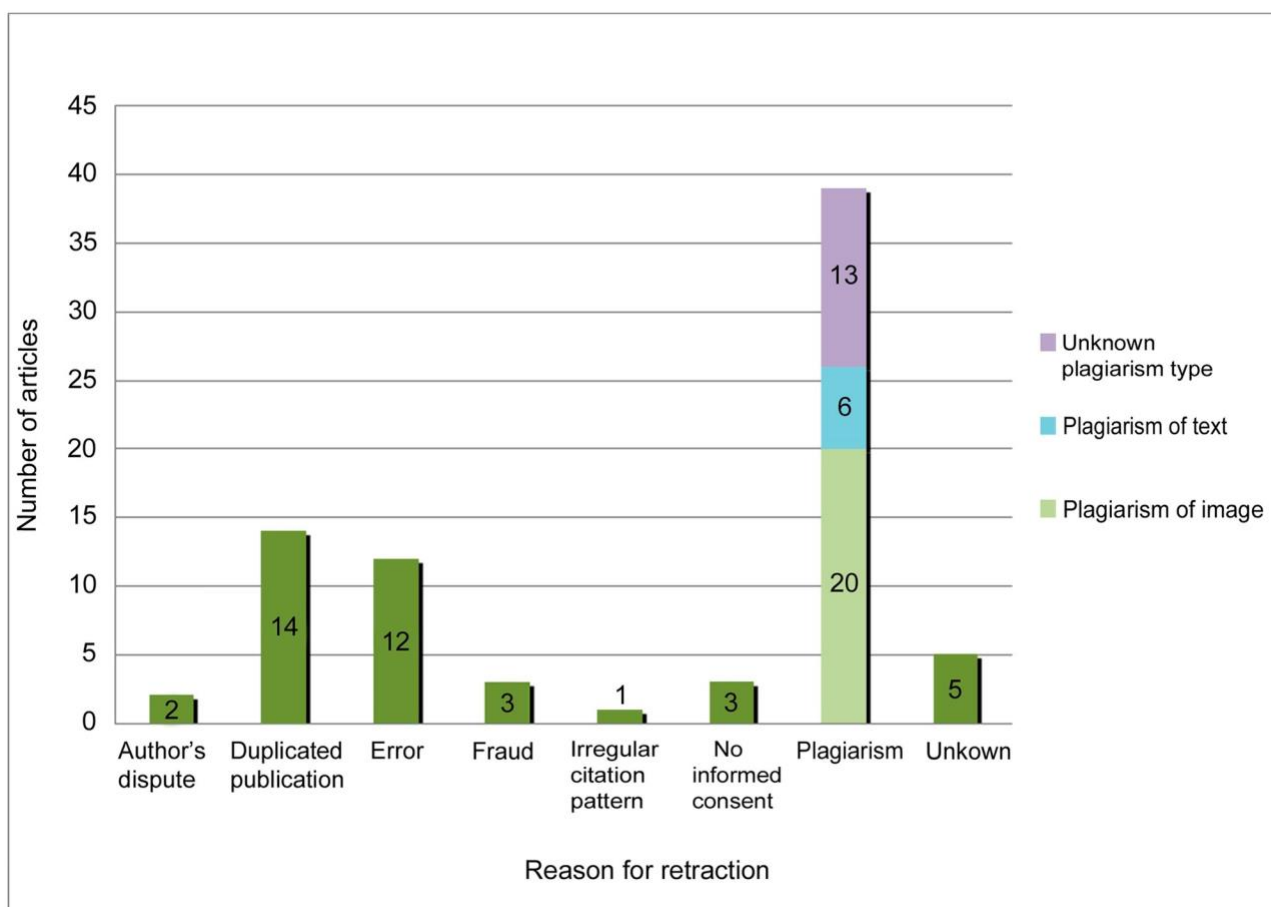


Fig 2. Count of articles by reason for retraction. Graphic representation: The distribution of number of articles by reason for retraction. Plagiarism is categorized under: a) unknown (purple bar), b) plagiarism of text (blue bar), c) plagiarism of image (light green bar).

<https://doi.org/10.1371/journal.pone.0214272.g002>

Association between the impact factor and the number of citations before the retraction

There was a moderate correlation between the number of citations/year of an article before its retraction and the impact factor of the journal in which it was published (Spearman rho = 0.43, $p < 0.05$).

This review sample size did not allow for a multivariate analysis. The details of this analysis can be found in the [S1 File](#).

Quality of data from the retraction notices

Retraction notices are supposed to cite the original article [7]. However, our results showed that a proper citation of the original article was present in only 22 (33%) retraction notices; 42 retraction notices did not cite the original article; 1 article was cited three times in its retraction, implying that the retraction notice applied to more than one publication. Missing data were found in 57% of the retraction notices retrieved. Missing information in retraction notices was mainly regarding: date of retraction (7%), reason for retraction (7%), who requested the retraction (3%) and endorsement by the authors (38.4%). Retraction warnings such as a withdrawn/retracted red sign over the article were also nonexistent (37%).

Reasons for retraction

The identified reasons for retraction are illustrated at [Fig 2](#). Thirteen articles (20%) were retracted for at least two distinct reasons. Fraud was responsible for the retraction of three articles: two were retracted for image manipulation [16], [17] and one for data manipulation. Errors were attributed to inappropriate statistical analysis ($n = 4$), study design ($n = 2$) and inadequate data collection ($n = 6$). Retractions for duplicated publications were attributed to authors in 71% of the cases and to editors in 4,6% of the cases. Although an author's dispute should not lead to a retraction [6], two articles accounted for retraction due to an author's dispute. However, there is no additional information available for these retractions; therefore, it is not possible to assume this was the only reason for the retraction.

Discussion

The comprehension of research integrity and the consequences of misconduct varies between different cultures [16], [17], [18]. Likewise, the concept of research integrity and research misconduct differ from institution to institution [2], [3]. In general, all institutions agree that fabrication, fraud and plagiarism negatively affect science to some extent, characterizing research misconduct [3], [13]; although, misconduct can have a wider definition [2]. Research integrity refers to a broader concept that does not necessarily imply misconduct or a direct effect on scientific integrity [13]. This diversity may explain the disparities between journals, publishers, research institutions, funders, and researchers when taking measures to prevent and report misconduct or breaches to research integrity. This scenario represents a challenge for academic studies on the matter.

In fact, for this review, the traditional bibliographic sources did not provide a complete picture of retracted articles. A total of eight (15%) articles were only identified on the

Retraction Watch website, highlighting difficulties in retrieving retractions and suggesting poor transparency in the reporting of retractions.

Another obstacle of research transparency is the diversity of journal policies to deal with this subject [6], in that they do not always follow the COPE recommendation for the publication of retraction notices. For instance, the use of footnotes or comments from readers as an alert of a retraction [25], [26] and the absence of any type of warning in the database or in the article that is available in the journal. In addition, this review identified an erratum that was actually a retraction notice. These results reflect that some journal policies disregard research integrity flaws.

Legal threats to publishers have an influence on their positions regarding misconduct and, therefore, on the issue of retractions [7]. Despite publishers concern over litigation, this review found complete information, transparency and clarity of other retraction notices, supporting the existence of disparities between editors' and publishers' attitudes towards handling errors or misconduct.

The fact that public institutions funded the majority of the retracted articles also raises concerns regarding the importance of coordinated action between institutions to prevent research misconduct and to allocate a responsible investment of public funds.

Reasons for retraction

In 2013, a Brazilian citation-stacking scheme used to increase journal impact factor was revealed [24]. Thompson and Reuters discovered that four journals were participating in selfcitation in order to boost their impact factor [27]. Despite of the considerable number of retractions that were made as a result of this scheme, this review search strategy was able to identify a unique paper that was retracted for an irregular citation pattern [28], which is known as citation stacking. This fact addresses once more the difficulties in finding retracted articles [29], [30] and, therefore, warrants the necessity of efforts to maintain transparency in every step of scientific assembly.

Previous studies have shown that fraud and error have accounted for most of the retractions of biomedical articles [4], [28]; however, the present review revealed a larger number of retractions due to plagiarism. Fraud refers to fabrication, falsification or manipulation of data while error implies no intention to compromise the study [13]. Plagiarism may refer to unjust appropriation of ideas (text plagiarism) or images (image plagiarism). This review showed that 76% of the reported plagiarism was accounted for by image plagiarism. Among the cases of image plagiarism, 15% of the retractions clearly stated the existence of similarities of images to previous publications and raised manipulation concerns. In addition, 33.3% of the retractions due to plagiarism did not specify the type of plagiarism.

In regard to image editing, there is a fine line between what is allowed and what is not, and there are no standardized guidelines of scientific journals [13], [31]. Coordinated action is needed in order to establish guidelines and education for authors regarding image editing and the rationale for what is considered misconduct [32].

The underlying factors to explain why image plagiarism is the major cause of misconduct are unclear. Nevertheless, the notable increase in retractions is an indicator of the awareness of scientific misconduct [33] in regard to different forms of plagiarism and the necessity of actions to avoid this behavior.

Are the increasing numbers of retracted publications a sign of scientific awareness of misconduct?

The results of this review are in accordance with those of previous studies about chronological trends of retracted publications [33], [34] that showed an increasing number of retractions in the past years. It is not possible to affirm that misconduct is increasing by evaluating only the retractions of authors affiliated with Brazilian institutions. Deeper investigation is needed to evaluate this aspect.

The increasing number of retracted publications over the years may be a sign of scientific awareness and response of authors, readers and institutions to flag questionable research [33], [34]. This can be illustrated by the request of authors to withdraw their article or the alert from other researchers to editors. In addition, more retractions are a reflex of advances in technology that can identify plagiarism and data manipulation [33], [34]. For instance, the use of software to identify image manipulation and plagiarism may increase the detection of such misconduct. Likewise, with a faster publication process, the publication of retractions and investigations—when needed—can be more efficient with the participation and collaboration of authors, institutions, researcher, and journals.

What is the purpose of a retraction if not to be used to avoid more scientific misconduct?

A recent publication explored the nature of retracted articles [9]. The authors classified the citations as positive, neutral or negative. An interesting aspect of this study was the evaluation of a proper citation method for retracted articles. Otherwise, a retracted article is cited as legitimate and, hence, reliable. In most cases, it is not possible to assess whether a retracted article served as a basis for a new scientific investigation despite its retraction or whether it was cited without careful attention. Our finding regarding post retraction citation patterns showed how often retracted articles continue to receive positive citations without accurate retraction identification.

Further investigation is needed to understand why unreliable studies are still cited as legitimate [35]. Nevertheless, it is important to address that retracted publications might be used for new scientific production. A proper citation of retracted publications brings awareness to the causes involving its withdrawal and assists authors in not ignoring the retraction. Proper citation gives researchers the tools to make decisions in accordance with obvious ethical implications.

The role of distinct actors in the publication of retractions

Retractions are published at the request of an author, publisher, editor, or community [4], [7], [8], [9]. The intention of a retraction is to promote transparency and clarity regarding research misconduct or an honest error that lead to flawed articles [4], [6], [7]. Thus, in accordance with the *COPE Guidelines for Retractions*, retractions should be published as soon as possible to avoid new citations of the unreliable work, researchers acting on its findings, or drawing more erroneous conclusions. Because the main goal is to minimize a chain of flaws, retractions should be transparent regarding the reason for the retraction, existence of endorsement by the authors, the date of retraction, a reference to the retracted article, a DOI, attachment to the original article and visibility [7], [36].

This review encompassed a wide range of retraction policies of different journals from the retraction wording to how the article is *red-flagged* [6], [7]. For wording, the reasons for the retraction were sometimes vague or absent. Information regarding retraction date and citation of the retracted article were also nonexistent for some publications. For methods to signal a retraction to readers, a variation from a big red note of *withdrawn/retracted (red-flag)* to a simple footnote was found. A possible explanation for the difficulties in retrieving articles for this review was the lack of a standardized publication of retraction notices. Furthermore, these practices are completely against the purpose of publishing retractions: transparency.

Endeavors to promote transparency are a caveat of unethical practices involving those involved in the scientific activity: scientists, publishers, editors, and academic institutions [18], [35], [36]; each has a specific role and may contribute to minimizing misconduct or not. Everybody has a role.

Limitations and strengths

Incomplete information of the retraction notices reduced the accuracy of our analysis. Hence, the results obtained may underestimate the number of retractions due to restrictions of our search strategy, the level of transparency of the published retractions and their availability in the bibliographic databases.

Additionally, our analysis did not include an assessment of the original paper's quality, and therefore, it is not possible to draw conclusions regarding the relationship between the research quality and retraction. Further investigations should be performed with this purpose since it is known that a retraction does not necessarily indicate a completely invalid study [1].

Since research integrity is a worldwide concern, despite the fact that this review considered only Brazilian institutions, its findings provide useful insights and could serve as a basis for future investigations.

Conclusion

Retraction notices do not account only for research misconduct; they are also an alert of honest mistakes during scientific practices [6]. Nevertheless, these incidents compromise the quality and validity of research results. Considering authors affiliated with Brazilian institutions, this review concluded that most of the retractions of articles in health and life sciences were retracted for research misconduct.

Journals, funders, academic institutions, and researchers have an important educational and surveillance role to play in preventing research misconduct. The enforcement of disciplinary and educational measures is fundamental to reduce the incidence of corrupted science. In addition, the creation of a standard instrument for reporting retraction notices would assure the discussion of ethical policies and would promote a uniform publication of retractions.

This study attempted to emphasize the importance of coordinated action among all involved in scientific production in order to promote research transparency. There is a positive impact of good practices when conducting investigations and reporting and publishing retraction notices. The underlying factors involving research misconduct remains unclear. Measures to prevent misconduct may take into consideration the particularities of each

society, including weakness and strengths, depending on the cultural aspects. However, the impact of bad science is borderless and is not culture-dependent.

Supporting information

S1 Table. PRISMA checklist. (PDF)

S2 Table. Study data. (XLS)

S1 File. Statistical analysis pipelines and rationale.
(PDF)

Acknowledgments

We would like to thank the editors, publishers, institutions and authors who contributed to a clear and transparent retraction notice. Without your integrity this review would not be possible.

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ETAPA 2

STAVALE R, PUPOVAC, V, FERREIRA GI, GUILHEM, DB. Research integrity guidelines in the academic environment: The context of institutions with retracted publications in health and life sciences in Brazil. *Frontiers*. **Aceito para publicação (Anexo 1)**.

Research integrity guidelines in the academic environment: The context of institutions with retracted publications in health and life sciences in Brazil

Abstract

Although research misconduct is responsible for most of retractions in health and life sciences of authors affiliated to Brazilian institutions, there are few studies evaluating retraction notices and research misconduct in the country. Comprehension of the form of research misconduct may share light on weaknesses and strengths of individual, organizational and structural factors toward the implementation of research integrity culture. This policy and practice review aims to access the available information of research integrity offices and guidelines from Brazilian funding institutions and universities involved with retracted publications in health and life science based on a previously published systematic review. Additionally, we summarize the available guidelines and policies for research integrity in the country. We searched for publicly available guidelines and offices for research integrity. Fifteen institutions were analyzed: five funding agencies and ten universities. Forty percent of the funding agencies promoted research locally, and 60% promoted research nationally. Considering the funding agencies with national activity, 66% had a commission for research integrity. Thirty percent of the universities has no official office of research integrity or any publicly available guidelines. Most of the institutions had retractions due to some form of research misconduct. Institutions from Brazil involved with retracted publications lack instruments to prevent, supervise, and sanction research misconduct. The institutions of the country have pieces of what should be a system to promote and sustain research integrity

practices. Nevertheless, there is a positive movement of researchers engaging in the investigation of research integrity, the creation of policies and training. This study emphasizes the increasing influence of Brazil's scientific collaboration and production globally, as well as the impact of retractions in medical sciences. In contrast, it addresses the need for clear research integrity policies to foster high-quality and trustworthy research.

1. Introduction

The National Science Foundation (NSF, USA) rank for countries with international publication classified Brazil in the 11th position, in 2018, reaching the number of 60,147.96 published articles (1). The country's top publications were in collaboration with European Union, United States of America, and other members of BRICS cooperative group (Brazil, Russia, India, China, South Africa) (2). Unfortunately the increase in scientific production is followed with large number of retracted medical papers. According to Retraction Watch (RW), in the past ten years, almost 2% (152/9360) of all retracted articles in health science are from authors affiliated to Brazilian institutions (3). In addition, evidence has shown that the majority of retractions in medical papers are related to research misconduct (4–6).

To foster quality and reliability of research, academic leaders and institutions started to disseminate research integrity standards. A systematic review gathered all the scientific articles published by Brazilian authors regarding research integrity(7). The review found that the first publication on the theme date from 2005 and most of the articles were on the field of health and life science. The number of scientific publications about research integrity increased since then raising awareness on the topic. However, Brazil's formalization of guidelines and offices to safeguard research integrity is ailing compared to other countries (8,9).

Simultaneously with the growth of publications, there are several articles that show an increase in the number of publications, followed by concerns about quality and reliability of these articles(6). The first retraction reported in health and life sciences by authors affiliated with Brazilian institutions was due to plagiarism (6,10). Since then,

other cases of research misconduct have been discovered, generating considerations about scientific advances in the country (6).

In that context, this study aims to review publicly available information of research integrity policies from Brazilian institutions involved with retracted publications in health science (7).

2. Research misconduct in health and life sciences

Research misconduct practices negatively impact public trust and favors misinformation (8). The use of unreliable findings and unethical research as basis for future investigations is detrimental to scientific advances(11); it affects evidence-based medicine by exposing individual to wrong medical decisions (12); and it may result in a waste of human and financial resources(13).

Retraction notices are an important instrument to communicate that a research is flawed and unreliable (14). Retractions are published when honest mistakes jeopardize the reliability of a scientific work or when research misconduct is found (14). The most common reason for retractions in health and life sciences is due to research misconduct (11,12,38,). However, the form of research misconduct that led to a retraction is controversial. A study focused on health and life science publications found that most of the retracted articles of researchers affiliated to Brazilian institutions were due to plagiarism (11). These findings corroborate with larger studies in South America databases (14). However, another study with biomedical publications concluded that the main cause of retraction was fraud (15).

There are few studies evaluating retraction notices and research misconduct institutions in Brazil (6,7,15). Comprehension of the form of research misconduct may share light to weaknesses and strengths of individual, organizational and structural factors towards the implementation of research integrity culture (15,16). Policies to prevent and control research misconduct would be more effective if guided by scientific evidence as it would provide better understanding of the problem (16).

3. Research misconduct: definitions, inhibitors, and boosters

Scientific knowledge must be trustworthy and reliable to benefit society (17). High standards of research presume robustness, rigorous, transparency through design,

execution, and report (17,18). These aspects are the foundation of high-quality research and of research integrity principles: reliability, honesty, respect, accountability, fairness (14,19).

The practices or actions that undermine the integrity of the research or researchers would be characterized as research misconduct (18,20). Most often, fabrication, falsification of data and plagiarism are accepted to jeopardize scientific knowledge; these are well known practices of research misconduct (14). However, there are other practices that negatively impact research reliability as well, such as authorship dispute, miss holding research results and lack of transparent reports (14,20). Moreover, research misconduct accounts for intentional or unintentional behaviors that damage research reliability. Therefore, allegations of not being aware of the misbehavior does not alleviate unethical practice.

Research misconduct practices negatively impact public trust and favors misinformation (8) In addition, it results in scientific, social, and economical waste (12,13,21). The use of unreliable findings and unethical research as basis for future investigations is detrimental to scientific advance(21) ; it affects evidence-based medicine by exposing individual to wrong medical decisions(12) ; it may result in a waste of human and financial resources(13). As an example, through the COVID-19 pandemic the lack of rigor and quality of scientific studies favored spread of fake information (22). The misinformation during the pandemic directly affected public health policies, trust in science and conversely adherence to scientific recommendations to contain the disease(22) .

Research integrity guidelines play an important role to promote research integrity principles, in addition to act into prevention, investigation and application of sanctions to research misconduct cases (23,24). Ethical guidelines and committees for research planning, conduction and report are well standardized in Brazil. However, specific policies for research integrity at Brazilian Universities and Funding Agencies are scarce(8). We searched for research integrity guidelines and, or offices of the funding agencies with the highest governmental budget involved in retractions of health and life science publications(7) .

4. Regulation and accountability for research misconduct of funding agencies

As for Brazilian context, each state of the country has a State Research Foundation (SRP), that foster scientific and technological research and dissemination. Apart from the SRP acting locally, there are national agencies to foment science such as the Coordination of Improvement of Higher Education Personnel known as CAPES and the National Council for Scientific and Technological Development known as CNPq.

We analyzed publicly available information of five funding agencies. Of it, 40% promoted research locally and 60% nationally. Considering the funding agencies with national activity, 66% had a commission for research integrity and all had published some guidelines related to research integrity practices. Still, some documents fail to contemplate principles, research misconduct, regulations, and punitive actions. For instance, CAPES published a declaration anti plagiarism with no mention to other aspects of research integrity. However, the institution doesn't have the original document available at its official website. Table 1 summarizes the main Brazilian funding institutions and the research integrity policies available.

The most active and transparent institution that promotes research integrity and responsible research is the São Paulo State Research Foundation (FAPESP). The first guideline for research integrity in the country was published in 2011 by FAPESP, giving this institution a leading position on addressing the topic. In addition, FAPESP advocates for research integrity culture by requiring from institutions that benefits from it support to regulate prevention, investigation, and punishment of research misconduct (6,17).

The National Research Council known as CNPq has a research integrity committee that is summoned when concerns are raised to research funded by the institution (25). The available documents define research misconduct as plagiarism, fraud and fabrication and doesn't clearly state research integrity principles. However, it addresses initiatives to prevent and punish research misconduct. The CNPq also had updated meetings with main researchers on the field around the country to safeguard better practices and regulations.

The role of universities to foster research integrity

We review publicly available information of ten universities with affiliated authors with retracted publications in health science. For it, we used data from a previous study published by our group(6) . Additional search was conducted to assess the total number retracted publications in health science flagged by Retraction Watch database from 2002-2022(3). While retraction notices do not only account for research misconduct most of the Universities included in this review were involved in research misconduct cases(6).

The two universities with the highest number of retracted publications in health and life science have official guidelines for good practices in research. Thirty percent of it has no official office of research integrity nor any guidelines publicly available. Table 2 summarizes the research integrity policies of Universities from Brazil involved with retractions and their total of retracted publications.

Universities plays an important role as supervisor and leader to advocate for research integrity culture(9,16,26). The institution recognition of good practices and sanction of research misconduct favors research integrity practices. Hence, official guidelines and punitive measures, when applicable, to researchers that produces questionable research can inhibit misbehave. Although cases of research misconduct often cause commotion from the scientific community, universities fail to communicate this cases outcome with transparency. Additionally, among the institutions with most retracted publications there were no disciplinary actions in cases of misconduct even for authors involved in multiple incidences.

In Brazil, there are discrepancies at the universities guidelines when it comes to research misconduct definition and penalizations (9). Furthermore, official research integrity agencies to investigate misconduct allegations and mediate conflicts are limited. This embodies challenges to the identification of research misconduct and actions to tackle misbehavior.

Universities policies for career progression system may also reinforce publication pressure and competitions (15,16). These behaviors are prejudicial to research integrity principles (38).

Although not all the universities involved with retracted publications had guidelines and research integrity offices, the number of scientific integrity committees and commissions in the country has grown significantly. For instance, the Federal University of Goiás, the Federal University of São Paulo, the Federal University of ABC and the Instituto Israelita de Ensino e Pesquisa Albert Einstein have specific scientific research offices.

Current challenges and future steps

Brazilian universities, funding agencies and researchers has been advocating for research integrity culture in the past years. In 2010, happened the first Brazilian Meeting on Research Integrity and Publication Ethics (BRISPE). The event was the result of a postdoctoral research project on research integrity at UFRJ (15). It was an important step towards research integrity awareness (15).

Considering funding agencies, in 2011, FAPESP was the pioneering to publish official policies for research integrity practices. The funding agency initiative encouraged other institutions to follow. As for research institutions, most of the southern universities had some guidelines or commission for research integrity (2). These universities account for more research aid, publications, national and international collaborations across the country.

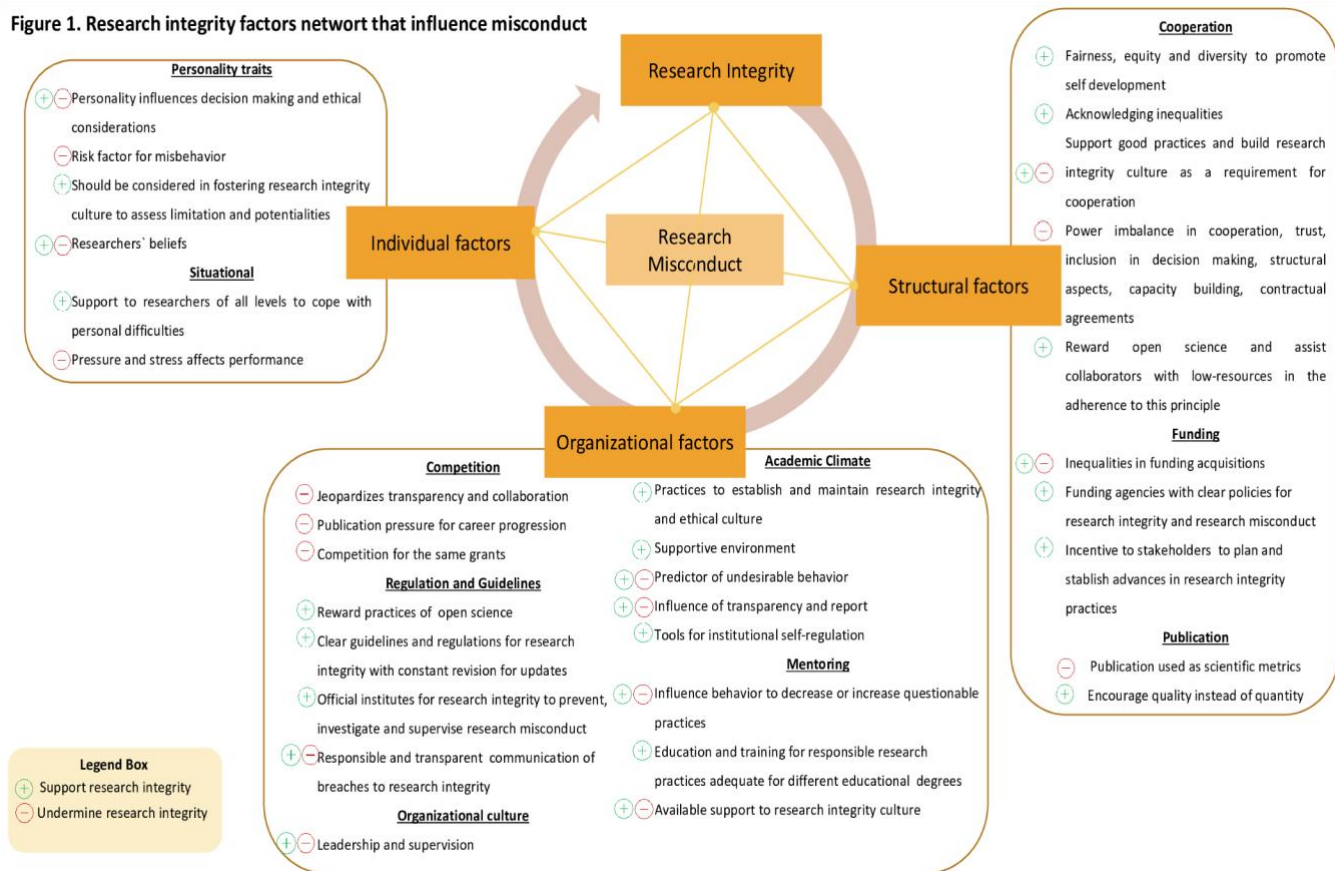
In the past years, researchers and institutions from Brazil played a leadership role into research integrity safeguards and investigations (15). Still, there is a long road ahead. Standardized guidelines and policies for research integrity that also addresses research misconduct are not yet available at all institutions (27).

Most of the publications from Brazilian institutions had collaborators from different countries (2). Hence, accountability for concerns to scientific reliability and quality of Brazilian institutions should be extended to those partnerships. The recognition of the large contribution of Brazilian research institutions to scientific community is fundamental to encourage cooperation towards the creation of research integrity policies and guidelines that suits the country context. Still, these guidelines and policies for research integrity should comply with international standards (28). Nevertheless, it should

consider social, cultural, and institutional diversity to warrant reliability, fairness, and equity (27).

There are several aspects that may contribute or inhibit research misconduct practices(16). It's known that it involves a complex and dynamic network of aspects that engage individual to structural action (29) (Figure 1). Furthermore, Brazil has limitations at the organizational level (academic climate, mentoring, guidelines, and competition) and the systemic level (cooperation, funding, publication) network that support research integrity. More studies are needed to understand the individual level characteristics of researchers affiliated to Brazilian institutions.

Figure 1. Research integrity factors network that influence misconduct



At the organizational level academic climate is under assessed. Although there are standardised tools to evaluate academic climate, there is no available publications with the validated instrument or assessing academic climate in the country (30,31).

Hence, the institutions self-regulation is flawed.

Evidence showed that mentoring in research integrity can influence positive behaviour or not (24). In Brazil, there are universities and funding agencies fomenting education and training to promote research integrity practices(8,9). However, more institutions across the country must be involve in the theme. In addition, the shortage of standardized recommendations in the country can be challenging for researchers and educators.

At the systemic level, researchers often struggle to adhere to research integrity principles due to short in financial resources, lack of infrastructure, competitive environment, or inadequate training . Brazil collaborates with institutions of higher and lower research capacities in comparison to its own institutions(2). Nevertheless, the cooperation among scientific institutions with unequal resources should consider balance potentialities and fragilities to build trust and increase research integrity culture (32,33).

7. Limitations and Strengths

This policy and practice review considered information available at the institution's website, therefore we cannot exclude the possibility of existing outdated documents online, nor the existence of non-included documents. However, updated online information at official institutions websites promotes transparency and accessibility to information. This study highlights the importance of research integrity guidelines and committees, ongoing investigations to be available at public official websites.

8. Conclusion

Institutions from Brazil involved with retracted publications lack of instruments to prevent, supervise, and sanction research misconduct. Although Brazil has an increasing influence in health research globally, the institutions of the country have pieces of what should be a system to promote and sustain research integrity practices. Still, there is a positive movement of researchers engaging in the investigation of research integrity, the creation of policies and training.

We recommend future policies and guidelines to follow international standards with respect to research reliability, fairness, diversity, and equity. The network of individual, organizational and structural factors that can affect research integrity is useful

to understand misbehavior and to guide future action. In addition, specific grants for research integrity investigations would accelerate awareness and increase resources to foster responsible research in the country.

At last, collaboration with international institutions should consider equal accountability for research misconduct. The impact of unreliable science is borderless and calls for global action to support research integrity culture.

9. Tables

Table 1. Research integrity policies of funding agencies from Brazil involved with retractions.

Table 1. Main Brazilian funding institutions and research integrity policies.		
Institution	Research Integrity Office	Research Integrity Practices
Coordination of Improvement of Higher Education Personnel -CAPES	Unavailable.	Declaration anti plagiarism and in favor of originality (this document wasn't available at the agency official website at the time of this research).
National Council for Scientific and Technological Development - CNPq	Commission for research integrity.	Committee for research integrity; Guidelines for research good practices.
FAPESP	Technical Chamber for Research Ethics (CTEP): an official institutional office to act in favor or research integrity and good practices.	Guidelines of Academic Integrity; Guidelines of Research Integrity and Ethical Responsibilities; Research Integrity column at FAPESP journal; Research Integrity Committee(34); Public records of ongoing investigations and updated results.
FAPEMIG	Unavailable	Guidelines for Responsible Practices regarding Rigor and Integrity during Scientific Research.
FIOCRUZ	Commission for research integrity	Guidelines for Research Integrity

Table 2. Research integrity policies of Universities from Brazil involved with retractions.

Table 2. Research integrity policies of Universities from Brazil involved with retractions.			
Brazilian University*	Research Integrity Office	Research Integrity Practices	Number of retractions (N)**
Universidade de São Paulo - USP	Commission of good practices in science	Guidelines for Good Practices in Science; Scientific Journal with a column for good practices in research	46
Universidade Federal de São Paulo - UNIFESP	Commission for institutional academic research integrity: an official commission to act against research misconduct. Created in 2017	Guidelines for Good Practices in Science currently being elaborated. Education program and training regarding research integrity and good practices in science; Organization and promotion of scientific events	18
Universidade Estadual de Campinas -UNICAMP	Commission for research integrity	-Institutional policy for good practices and research integrity of the Universidade Estadual de Campinas	36
Universidade Federal do Rio de Janeiro -UFRJ	Technical Chamber for Research Ethics (CTEP): an official institutional office to act in favor or research integrity and good practices	-Guidelines of Academic Integrity; Guidelines of Research Integrity and Ethical Responsibilities (35)	3

10. Figure Caption

(A): Figure 1. Research integrity factors network that influence misconduct

11. Author Contributions

Stavale, R. conceived the idea presented, developed the study and experimented. Ferreira, G.I. and Guilhem, D. verified the analytical methods. Pupovac, V. encouraged to investigate a new specific aspect and supervised those of this work result. All authors respond to the results and to the final manuscript.

12. Funding

This study did not receive financial support for its development.

13. Acknowledgments

We would like to thank all the individuals, universities, funding agencies, and institutions advocating for research integrity across Brazil. Additionally, we also appreciate the partnerships around the world that has been done to exchange knowledge for the sake of research quality and to foster research integrity development with equity.

14. Supplementary Material

Supplementary data is submitted with this article.

15. Data Availability Statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

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ETAPA 3

DRAFT

Fraud, misconduct and fake news in the academic, medical and social environment

Research misconduct in health and life sciences in Brazil

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What is sloppy science and what are the concepts of research misconduct?

Scientific knowledge is the most trustworthy and reliable knowledge. Scientists follow strict rules of scientific methodology in production of new information and even more important, they have to be open to criticism, improvement and replication of their ideas (1,2). In order to maintain high standards of knowledge production, the scientific community must follow ethical guidelines and research integrity principles (3,4).

According to the Brazilian research foundation FIOCRUZ, Research Integrity (RI) is a field of reflection on the norms, principles and ethical guidelines that regulate the development of academic and scientific research, it encompasses all stages of scientific work, from conception to publication (5). The organization consider five RI principles: honesty, objectivity, respect, responsible research, transparency. The principles and values of FIOCRUZ are in accordance to international guidelines (4,6).

Scientific trustworthy and validity relies on research practices that are in accordance with these principles during planning, undertaking, reviewing, reporting and communicating research (1,4,7,8)

Research Integrity (RI) concept and principles is constantly in discussion and may vary from guidelines or through time (8,9). Still, it is accepted that research integrity blends into scientific ethics (8,9). For instance, respect towards colleagues, participants of the research, and society, responsibility for managing and organizing a research, for supervising younger researchers with encompasses a broader conception of research integrity (6,10-12).

The opposite of these principles would be characterized as research misconduct. It implies a wide spectrum of behavior that compromised scientific robustness, trustworthiness and transparency (7). Most often, fabrication, falsification of data and plagiarism (PPF) are accepted to jeopardize scientific knowledge; hence these are well known practices of research misconduct (7,8). However, there are other practices that negatively impact research production as well, such as authorship dispute, lack of transparency when reporting results, inadequate supervision (8). These are examples of questionable research practices that generates concern and may undermine research integrity principles (8).

What are retractions for and the most common reasons for health and life science retraction?

Retraction notice is an important tool to alert scientists of unreliable research. It is important to address that publication of retractions are not only used for research misconduct practices but for situations where research results are flawed and shouldn't be used as bases for clinical practice or future scientific investigations. According to COPE, recommendations for the publication of retractions are (1):

- Honest errors (for instance statistics miscalculation);
- Unethical research;
- Practices of misconduct (fraud, fabrication, plagiarism);
- Compromised or manipulated peer review process;
- Use of data or material without authorization.

In addition, COPE recommends what are the contents the retraction notice should endorse. Still, the publication of retraction notices is often incomplete, doesn't clearly state the

reasons for retractions or use different wording when it comes to research misconduct practices such as plagiarism, fraud or fabrication.

The most common reason for retractions in health and life science is due to research misconduct (3, 13-16). However, the form of research misconduct that lead to a retraction is controversial. A study focused on health and life science publications found that most of the retracted publications of researchers affiliated to Brazilian institutions were due to some form of plagiarism and image plagiarism accounted for the main type (13). In the same study medical science was responsible for the majority of retractions, cases of research misconduct and not included. These findings corroborates with larger studies in South America databases that also found plagiarism was the main reason for retractions (17), however a larger study with biomedical publications conclude that the main cause of retraction was fraud (15). Several studies found that Medical Science or Biomedical Science, Chemistry, Life Science and multidisciplinary studies are most prone to retractions (13,16-18).

Regulation and accountability for research misconduct: who should be responsible? The role of institutions and research integrity policies

Research institutions such as Universities, Funding Agencies and Scientific Journals play an important role to promote and assure research integrity practices (4,19). Universities may foster an adequate academic climate, endorse ethical guidelines, support education activities for early or experienced researchers, offer periodic updates of responsible research, a research integrity office or ethical committee and reward responsible research practices. Instead of using number of publications or publications in high impact journals and grants as metrics to reward researchers, the university could adapt the criteria to assess and incentive practices that address research integrity (7).

Funding Agencies may provide incentives to responsible research, endorse ethical guidelines, reprove research misconduct and even sanction these behaviors refusing grants or offer incentives to good practices. Scientific journals may add to their submission process steps that favor responsible research and research integrity such as authors' agreement letters, transparency with data etc. Finally, individuals that produce

and consume scientific knowledge also play an important role by acting in accordance to research integrity guidelines, communicating research flaws when aware of it and replicating information on this theme.

As for Brazilian context, the country has a unified platform – *Plataforma Brasil* – to submit all research protocols involving human subjects to the CEP/ CONEP System. The Brazilian System of Research Ethics is constituted by a National Commission of Research Ethics and 853 Research Ethics Committees (20). Therefore, ethical practices for research planning are well standardized in the country. However, specific offices for research integrity at Brazilian Universities and Funding Agencies are scarce. A systematic review gathered all the scientific articles published by Brazilian authors regarding research integrity (12). The review found that the first publication on the theme is from 2005 and ever since the number of publications on the thematic is rising. In addition, the majority of the publications were on the field of health and life science.

Taking into consideration some of the leading universities in the country, the availability of a Research Integrity Office and their practices towards promoting and assuring research integrity are growing over the years. Table 1 summarize the main Brazilian universities, their research integrity policies.

Table 1. Main Brazilian universities and research integrity policies		
Brazilian University	Research Integrity Office	Research Integrity Practices
Universidade de São Paulo - USP	-Commission for institutional academic research integrity: an official - Scientific Journal with a column for good research practices in research misconduct.	- Guidelines for Good Practices in Science; commission to act against Since 2017.
Universidade Federal de São Paulo - UNIFESP	- Comissão Institucional de Integridade Acadêmica: an official commission to act against research misconduct. Created in 2017.	- Guidelines for Good Practices in Science; de - Education program and training regarding research integrity and good - Organization and promotion of events.
Universidade de Campinas - UNICAMP	- Commission for research integrity. Universidade	-Institutional policy for good practices and research integrity of the Estadual de Campinas UNICAMP
Universidade Federal do Rio de Janeiro (CTEP)	- Câmara Técnica de Ética em Pesquisa Guidelines of Academic Integrity; do Rio de Janeiro (CTEP): an official institutional office Guidelines of Research Integrity and to act in favor or research integrity and Ethical Responsibilities.	

good practices.

Universidade Federal - Commission for Research integrity guidelines. **do Rio Grande do Sul**
research integrity

Universidade Federal - Permanent commission for research Guidelines for Research Integrity in **de Minas Gerais**
integrity Scientific Research.

Universidade Federal Ethics committee handles research Guidelines for Responsible Practices **do Paraná**
integrity issues. regarding Rigor and Integrity during

Scientific Research

Universidade Federal - Commission for research integrity. Research integrity and ethics academic
de Goiás code.

Workshop for academic research integrity.

At the Universidade Federal do Rio de Janeiro (UFRJ) there is an active group of faculties working with bioethics and research integrity. The Universidade Federal do Mato Grosso (UFMT) is known for acting when it comes to measures against research misconduct practices of their faculty members. After extensive investigation, the institution exonerated a professor involved in several cases of research misconduct.

As for funding institutions, the São Paulo State Research Foundation - FAPESP has a research integrity committee that investigates research integrity and raises concerns of given grants (21). The institution maintains at their official website public records of ongoing investigations and their results. The National Research Council (Conselho Nacional de Pesquisa) - CNPq has a research integrity committee that is summoned when concerns are raised to researchers funded by the institution grants (22). Both institutions have information about research integrity in their official websites and clear research integrity policies (21-22).

The most active and transparent institution that promotes information on research integrity and responsible research is FAPESP. The institution has a column on their journal dedicated to the theme, publicly provide information about ongoing investigations and even sanctioned authors with a significant involvement in research misconduct, prohibiting them to apply for new grants. Table 2 illustrates the main funding agencies in the country and their research integrity policies.

Table 2. Funding agencies and policies for research integrity

Funding agency	Research integrity practice	Regulation
Coordination of Higher Education Personnel - CAPES	Declaration anti plagiarism and in favor of originality (this document wasn't available at official website at the time of this research).	National Improvement
National Council for Scientific and Technological Development - CNPq	Committee for research integrity; Guidelines for research good practices.	National
FAPESP	Guidelines of Academic Integrity; Guidelines of Research Integrity and Ethical Responsibilities; Research Integrity column at FAPESP journal; Research Integrity Committee(34); Public records of ongoing investigations and updated results.	InteLocal
FAPEMIG	Guidelines for Responsible Practices regarding Rigor and Integrity during Scientific Research.	Local
FIOCRUZ	Guidelines for Research Integrity	Local

Final considerations

How to prevent and avoid research misconduct is still a concern for the scientific community. It is accepted that scientific misbehavior is a multifactorial phenomenon involving individual moral values (17), academic climate and pressure to publish (17), differences on the perception of gravity of misbehave, constant education and training, clear policies to incentive good practices or punish misconduct (23,24). In that context, existing codes and guidelines are not sufficient to prevent such episodes; a range of systematic and regular measures must be taken into consideration by all institutions and individuals involved in scientific production and consumption.

There is a positive movement of researchers engaging in the investigation of research integrity. At 2010 the first Brazilian Meeting on Research Integrity, Science and Publication Ethics (BRISPE), organized by the Medical Biochemistry Institute at the Universidade Federal do Rio de Janeiro and the Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering, marked an important step towards the reunion of researchers, academic members, students into the discussion of ethics and research integrity. The event gathered national and international researchers on the theme

and finalized its activities with a joint statement regarding research integrity available in Portuguese, English and Spanish. Ever since, attention to research integrity has been growing implicating in more scientific production and participation at national and international events (25).

Collaboration with other institutions across the world may assist the development of future research and policies to foster a responsible research culture. Still, local incentives play a central role to better understand assets and gaps at the Brazilian system to promote research integrity.

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ETAPA 4

Retração de artigos sobre COVID-19 na saúde: uma revisão sistemática

Resumo

Introdução: O cenário de pandemia por COVID-19 foi marcado pela necessidade de uma resposta rápida e confiável da comunidade científica que culminou em vasta produção de pesquisas e publicações. No entanto, houve várias retratações e retiradas de artigos durante esse período. O grande número de retratações em curto prazo é reflexo do desenvolvimento de estratégias eficazes para promover a integridade da pesquisa, contudo, pretende-se compreender as principais causas para essas retratações. **Objetivo:** Elaborar e registrar protocolo de revisão sistemática; executar revisão sistemática para identificar as principais causas de retratações de artigos da área da saúde/vida, durante emergência de saúde pública com a pandemia por COVID-19. **Método:** Dois revisores independentes pesquisaram por artigos retratados nas bases de dados PubMed, Web of Science, Scopus Google Scholar e Retraction Watch, publicados entre 2019 e 2022. O protocolo está disponível na Open Science Framework (OSF). **Resultados:** Ao todo 225 artigos foram incluídos nesta revisão, sendo artigos no formato *preprint* (n=34) e com *peer review* (n= 191). O motivo de retratação não estava descrito em 24% dos artigos, 13% das publicações foram retratadas por falta de aprovação no comitê de ética, 13% foi uma duplicação de publicação. **Conclusão:** Os resultados desta revisão abrirão caminho para uma melhor compreensão do impacto da pandemia por COVID-19 na integridade e ética da pesquisa, além de fomentar a discussão quanto a estratégias para promover transparência em pesquisa, manter a confiabilidade e qualidade na ciência. Além disso, é um apelo ao rigor e à integridade científica, pois a ciência estava impactando diretamente as decisões médicas, as políticas de saúde pública quase no mesmo instante em que artigos eram publicados.

Protocolo de Revisão Sistemática para OSF

1. Review Question

- What are the reasons for the retraction of publications in health and life science about COVID-19 or SARS-CoV-2 published from December 2019 till October 2021?
- What is the chronological trend between the date of publication and retraction?
- What is the citation pattern of the article after retraction?
- What types of studies are retracted?
- What is the prevalence of adherence to EQUATOR guidelines of the retracted articles?
- What is the number of retracted publications by author and institution?
- What is the prevalence of published retractions registered in preprint repositories?
- Is there a correlation between the impact factor of the journal and the number of citations after the publication has been retracted?
- What is the prevalence of journals embracing ethical guidelines (COPE)?
- How the retracted publications were signaled by the journals, and what are the most prevalent forms?

2. Searches

Two independent reviewers will search for articles retracted since December 2019 in Scopus, PubMed, Web of Science, Google Scholar databases using indexed keywords from MeSH and DeCS for Portuguese, English, or Spanish publications.

Data will also be collected from an independent website that reports retracted papers worldwide (www.retractionwatch.com), using a filter for COVID-19 and/or SARS-Cov-2.

Additional search strategy information can be found in the attached PDF document (link provided below).

3. Condition or domain being studied

This review aims to investigate the prevalence of medical and life science research retractions about COVID-19 or SARS-CoV-2 by the assessment of chronological trends between publication and retraction, the reasons for retraction, the existence of the citation after the publication of a retraction notice, study design of the original article and adherence to EQUATOR recommendations for study report, the number of retracted publications by particular authors, and the institutions to which they belong. It will also collect data regarding the availability of retracted papers by the publisher.

The review is, therefore, a study of research integrity by the analysis of retracted articles and retraction notices regarding COVID-19.

4. Type of studies to be included

All types of studies will be included. Retraction notices with or without corrections, or retractions without complete information regarding the justification for the retraction, the date of the retraction, or whether COPE ethical guidelines were followed or not will be included.

5. Context

Articles from health and life sciences published in national and international journals that have been retracted, corrected, and republished or not after retraction will be included in this review. Publications will be included from the year 2019 to 2021 in the languages: Portuguese, English, and Spanish. The year 2019 marks the beginning of the pandemic, according to the World Health Organization. All articles that meet the inclusion criteria will be included regardless of the type of study.

6. Main Outcomes

The reasons for retraction, the associated institutions, the areas of research and the numbers of retracted with or without correction publications by authors and institutions, and citation patterns before and after retraction, preprint repositories.

7. Additional Outcomes

The types of study retracted, the trends between the year of publication and retraction, journals' impact factors, and the adherence to ethical guidelines in journals. Retraction notices according to COPE and the retracted article signaling.

8. Data extraction

The research will be carried out in the electronic databases previously mentioned. The search will be carried out at the same time period, by the Group of Reviewers. The group will follow the same research protocol to select articles, so it will be possible to assess the quality of the protocol for this review. Disagreements between review authors will be resolved by discussion, with the involvement of a third review author when necessary. For analysis purposes, the Review Group will collect the data in accordance with this protocol and will use the same instruments for it.

Two independent researchers from the group will select studies for this review following this protocol. In case of disagreements, a third researcher will be consulted.

Data will be stored at Excel spreadsheets to be filled with,

Article title, year of publication, year of retraction, authors, authors affiliation, journal, journal impact factor, journal COPE adherence or ethical guidelines, number of citations, retraction signal (band, withdrawn/retracted), reason for retraction, preprint available, database that the article was screened. Missing data must be signaled at the data collection tool, such as information about the need of a third reviewer in case of disagreement.

9. Risk of bias

Risk of bias assessment of each article is not applicable to this study since we will analyze retraction notices - mainly.

Disagreements between reviewers will be resolved by a third judge - an experienced researcher in bioethics and research integrity who will make the final decision.

10. Strategy for data synthesis

We plan to conduct a descriptive analysis of the main reasons for retraction, the type of study published, preprint repositories, and the trends between the year of publication and year of retraction. An analysis of the correlation using the Spearman technique is planned for number of citations after retraction, and the impact factor of the journal in which the article was originally published. For it Stata17 (StataCorp) statistical program will be used.

11. Dissemination plans

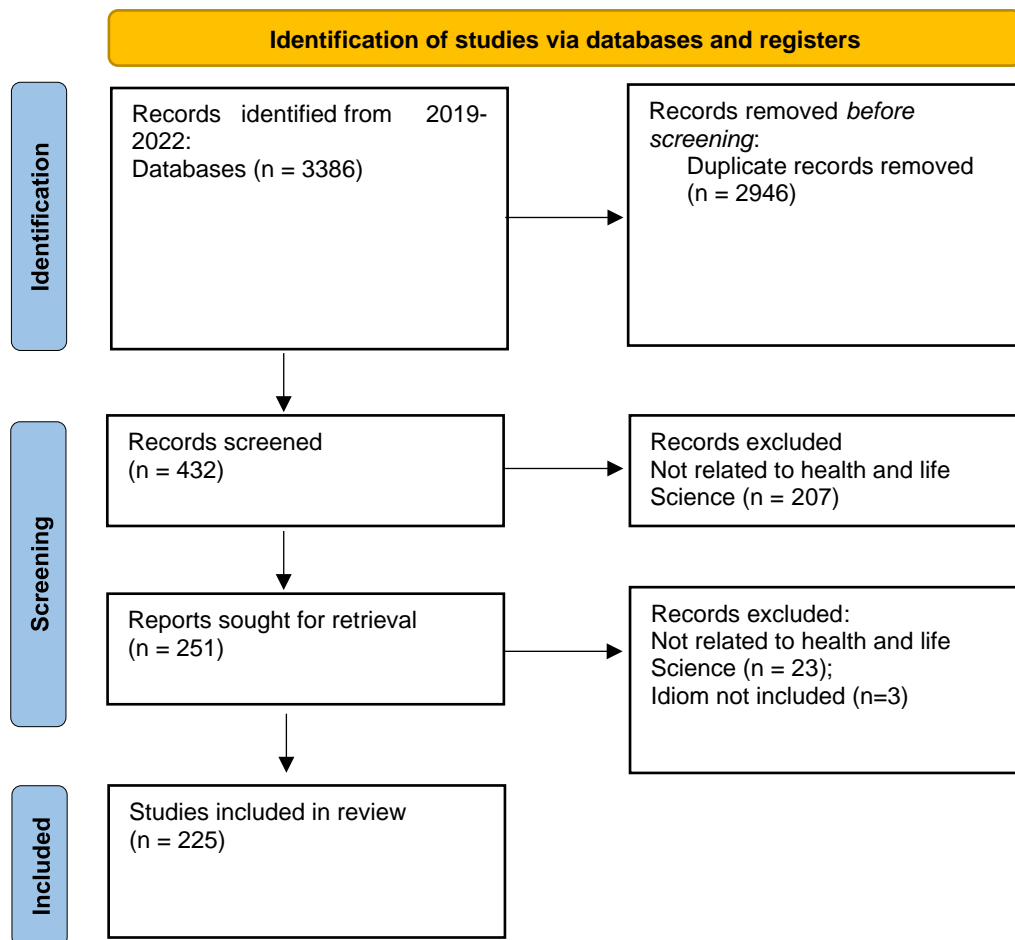
The results of this review will be presented at international (World Congress of Research integrity) and national congress and will be published at a medical journal to be chosen.

Resultados

O protocolo foi registrado na OSF após ser recusado pela PROSPERO por não envolver intervenção clínica (Anexo 2).

Ao todo, 225 artigos foram incluídos nesta revisão, publicados entre 2020 e 2022 em periódicos com fator de impacto que varia de 0 a 26.7. Trinta e quatro artigos retratados foram publicados como *preprints*.

O fluxograma abaixo ilustra os estudos identificados para inclusão na revisão.



Fonte: Editado pela autora com base no PRISMA, disponível em: <https://prismastatement.org/PRISMAStatement/FlowDiagram>

O motivo de retratação esteve ausente em 24% das retratações, 13% das publicações foram retratadas por falta de aprovação no comitê de ética, 13% foi uma duplicação de publicação, 7% foi por plágio e 4% por uma publicação prematura (*preprints*).

Além disso, foram encontrados artigos retratados por motivos pessoais (n=1), conteúdo incoerente (n=4), resultados prematuros (n=8), manipulação do processo de revisão (n=1).

CONCLUSÕES

CONCLUSÃO

As retratações não são utilizadas apenas para indicar má conduta científica, mas para alertar sobre erros que comprometem a qualidade e a confiabilidade de publicações. Apesar disso, conclui-se com os achados da revisão sistemática que a principal causa de retratação de artigos da saúde, de autores filiados a instituições brasileiras, é alguma prática de má conduta científica.

A partir da etapa 2 deste trabalho, conclui-se que instituições do Brasil envolvidas com publicações retraídas carecem de instrumentos para prevenir, supervisionar e sancionar má conduta de pesquisa. Embora o Brasil tenha uma influência crescente na saúde pesquisa globalmente, as instituições do país têm peças do que deveria ser um sistema para promover e sustentar práticas de integridade em pesquisa. Ainda assim, há um movimento positivo de pesquisadores engajados na investigação da integridade da pesquisa, na criação de políticas e treinamento.

A análise de retratações se mostrou um importante instrumento para compreender o cenário brasileiro frente a cultura de integridade científica e prática científica responsável. Porém, é importante ressaltar o papel de instituições de ensino e pesquisa, pesquisadores, editores e revistas, instituições de fomento na promoção da integridade científica.

A falta de dados nas notas de retratações impactou os resultados deste estudo em dois momentos diferentes: na etapa 1 e na etapa 3. Dessa forma, a publicação de notas de retratações com informações completas auxilia na tomada de decisão na prática baseada em evidência e no planejamento de futuras pesquisas.

Em um cenário de emergência em saúde pública, em que era necessária produção científica rápida, a confiabilidade na ciência que foi questionada. Dessa forma, o respeito a preceitos éticos e rigor metodológico em todas as etapas da pesquisa, assim como, o processo editorial transparente, publicação de retratações segundo recomendações do COPE auxiliam na promoção e manutenção de boas práticas na pesquisa em situações de crise ou não.

A relevância de se compreender os aspectos que envolvem a integridade científica ou práticas de má conduta foi ressaltada durante a pandemia, contudo faltam instrumentos para melhorar a qualidade e a confiabilidade das produções científicas no país.

Recomendamos a criação e adesão de políticas e diretrizes futuras para seguir os padrões internacionais com relação à pesquisa com respeito a confiabilidade, justiça, diversidade e equidade. A rede de indivíduos, organizações e fatores estruturais que podem afetar a integridade da pesquisa são úteis para entender o mau comportamento e orientar ação futura. Além disso, subsídios específicos para investigações de integridade em pesquisa acelerariam conscientização e aumentar os recursos para fomentar a pesquisa responsável no país.

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ANEXOS

ANEXOS

Anexo 1. Aceite publicação artigo 2

The screenshot displays a 'My Submissions' dashboard. At the top right, there is a link for 'Author Guidelines'. Below this, there are search and filter options: 'Search by title or ID' with a magnifying glass icon, 'Status: All' with a dropdown arrow, and 'Article types: All' with a dropdown arrow. A progress bar shows the following counts: 1 All, 0 In Preparation, 0 Initial Validation, 0 Editorial Assignment, 0 Independent Review, 0 Interactive Review, 0 Review Finalized, 1 Accepted, 0 Published, 0 Rejected, and 0 Deleted. The 'Accepted' status is highlighted with a blue underline. The main content area shows the article title 'Research integrity guidelines in the academic environment: The context of institutions with retracted publications in health and life sciences in Brazil' with a green 'ON TIME' badge. The authors listed are 'Rafaely Stavale, Vanja Pupovac, Graziani Izidoro Ferreira and Dirce Bellezi Guilhem'. The 'Handling Editor' is 'Nicole Foeger'. The journal information is 'Frontiers in Research Metrics and Analytics' and 'Scholarly Communication'. A timeline shows 'Submitted on 12/07/2022' and 'Accepted on 15/08/2022'. There is a 'Not yet paid' label and a blue 'Pay' button. At the bottom right, there are two buttons: 'Go to Review Forum' and 'Go to Production Forum'. A vertical blue bar on the right edge contains the text 'Give Feedback'.

Anexo 2. Resposta PROSPERO

 **CRD-REGISTER** <irss505@york.ac.uk>
para mim ▾

qua., 9 de mar. 01:06

 inglês ▾ > português ▾ [Traduzir mensagem](#)

[Desativar](#)

Dear Miss Stavale

Thank you for submitting details of your systematic review "Research misconduct during the COVID-19 era: a systematic review of retracted medical and life science publications since the start of the pandemic" to the **PROSPERO** register.

It is felt that the methods proposed in your review are not synonymous with those of systematic review. Systematic review methods may not be appropriate, to answer your research question.